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PRACTICAL GUIDE FOR PUBLIC SAFETY CRISIS RELOCATION PLANNING.(U)
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**PRACTICAL GUIDE
FOR PUBLIC SAFETY
CRISIS RELOCATION PLANNING**

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II

FINAL REPORT

September 1980

Contract: DCPA01-77-C-0212
Work Unit 2531F

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RYLAND RESEARCH, INC.

Santa Barbara, California

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PRACTICAL GUIDE FOR PUBLIC SAFETY CRISIS RELOCATION PLANNING

FINAL REPORT

September 1980

by
HAROLD HICKS
HARVEY RYLAND

for
FEDERAL EMERGENCY MANAGEMENT AGENCY
Washington, D. C. 20472

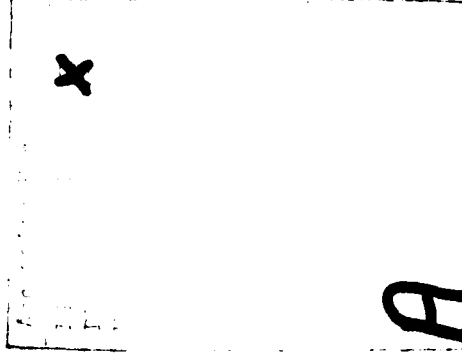
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21. ABSTRACT (Continue on reverse side if necessary and identify by block number) A crisis relocation, as well as other types of civilian evacuation, imposes significant demands upon a community's public safety resources (law enforcement, fire protection, and rescue medical services). In planning for public safety operations, personnel must estimate the types and magnitude of these demands; and, if possible, establish procedures for reducing these demands to manageable levels. This Guide: (a) identifies factors which can lead to increased resource require-		

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(c) suggests techniques for increasing the availability of
current resources; (d) provides procedures (and a computer program)
for estimating public safety resource requirements for an evacua-
tion operation.

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TABLE OF CONTENTS

1. DETACHABLE SUMMARY	iii
2. ABSTRACT	v
3. INTRODUCTION	1
4. CRISIS RELOCATION AND EVACUATION SCENARIO	4
5. EVACUATION DEMANDS	8
6. WORKLOAD REDUCTION METHOD	11
7. RESOURCE REQUIREMENT ESTIMATION TECHNIQUE	24
8. FIRE PROTECTION RESOURCE ALLOCATION MODEL MANUAL DATA PROCESSING INSTRUCTIONS	31

ILLUSTRATIONS

FIGURE 1 COMPARISON OF DEMANDS ON PUBLIC SAFETY RESOURCES TO SUPPLIES OF RESOURCES	10a
FIGURE 2 ALLOCATION METHOD	27
FIGURE 3 TYPICAL INPUT DATA (Sheet 1 of 2)	29a
(Sheet 2 of 2)	30a
FIGURE 4 FIRE PROTECTION QUESTIONNAIRE	31a

TABLE OF CONTENTS (CONT'D.)

FIGURE 5	TYPICAL FIRE PROTECTION RESOURCE ALLOCATION REPORT PRODUCED MANUALLY (Page 1 of 3)	32a
	(Page 2 of 3)	33a
	(Page 3 of 3)	34a
TABLE 1	RELOCATION PHASE TIME LINE ACTIVITY	26a
TABLE 2	TYPICAL GENERAL RISK AREA INFORMATION	27a
TABLE 3	TYPICAL RISK AREA OPERATIONS PLAN	28a
TABLE 4	SPECIFIC FIRE INCIDENT TYPES AND CORRESPONDING DATA	32
REFERENCES	16a
APPENDIX A	FIRE PROTECTION COMPUTER PROGRAM LISTING	43

DETACHABLE SUMMARY

The relocation of citizens in an international crisis situation is being considered as a key component of the U.S. civil defense program. Crisis relocation is the controlled, orderly evacuation of a community which is a possible target for foreign attack. The concept of crisis relocation is based upon the theory that a threat of foreign attack (particularly nuclear) could be reduced if citizens in target areas are dispersed throughout smaller, non-target communities. Thus, the relocation of the majority of the population in a risk area could serve as a deterrent to further escalation of the crisis situation, as well as protect lives if an attack actually occurs. Studies have shown crisis relocation to be a viable concept.

Civilian evacuations may also be initiated by the occurrence (or threat) of natural and man-made disasters, such as hurricanes and hazardous materials spills.

Public Safety (law enforcement, fire protection, and rescue medical services) is one of the more critical aspects of a crisis relocation operation or other type of evacuation. These public safety agencies have a primary responsibility for the actual evacuation of citizens, as well as for the protection of life and property, throughout the relocation period. Thus, unless adequate consideration is given to workload planning, a significant increase in workload may occur due to:

- an increased level of activity, e.g., traffic direction and control, guarding business establishments, fire prevention, etc.
- an increased level of incidents, e.g., accidents, fights, fires, medical emergencies, etc.

However, there are relatively simple techniques which can be used by a public safety agency to:

- decrease the demand for resources (e.g., use response procedures that require fewer personnel)
- increase the availability of current resources (e.g., use a 12 hour per day shift arrangement).

In any case, local government public safety officials must estimate the types and quantities of resources required to support a crisis relocation or other type of evacuation.

This Guide contains simple techniques and procedures for use by personnel of fire, law enforcement, and rescue medical agencies to estimate resource requirements and identify alternative methods of reducing required resources, as well as increasing the availability of current resources. The resource requirement estimation process is presented as a set of manual procedures and a computer program.

After using the Guide, a particular public safety agency should have a general idea of:

1. What steps will be taken to reduce resource demands;
2. what steps will be taken to increase availability of current resources; and
3. the types and quality of resources to be used in the event of a crisis relocation (or other type of evacuation) considering the steps taken in Items 1 or 2 above.

ABSTRACT

A crisis relocation, as well as other types of civilian evacuation, imposes significant demands upon a community's public safety resources (law enforcement, fire protection, and rescue medical services). In planning for public safety operations, personnel must estimate the types and magnitude of these demands; and, if possible, establish procedures for reducing these demands to manageable levels. This Guide:

- a) identifies factors which can lead to increased resource requirements;
- b) suggests techniques for reducing these requirements;
- c) suggests techniques for increasing the availability of current resources;
- d) provides procedures (and a computer program) for estimating public safety resource requirements for an evacuation operation.

The Guide was prepared especially for use by local government public safety planning personnel.

SECTION 1

INTRODUCTION

What is Crisis Relocation?

"Crisis Relocation" is the controlled, orderly evacuation of a community which is considered a possible target for foreign attack. Under this program, citizens in target (or "risk") areas would be dispersed throughout smaller, non-target communities upon occurrence of an extremely severe international situation.

The concept of crisis relocation is based upon the theory that a threat of foreign attack (particularly nuclear) can be reduced if citizens are no longer in target areas. Thus, the relocation of the majority of the population in a risk area could serve as a deterrent to further escalation of the crisis situation, and could protect lives if an attack actually occurs.

Studies conducted by the Federal Emergency Management Agency, including surveys of residents in potential host areas, have shown that crisis relocation is a viable concept. In addition to addressing the overall feasibility of the concept, research has been conducted in specific functional areas, such as: transportation, communications, housing, and finance.

Research in the roles of public safety agencies in a crisis relocation operation has also been conducted. This effort has resulted in the identification of major or unique crisis relocation functions in law enforcement, fire protection, and rescue medical services. For each such function, corresponding procedures, resources, and management and coordination requirements were established. This information is documented in reports which are available from the Federal Emergency Management Agency.

Much of the public safety crisis relocation research is also applicable to civilian evacuation; therefore, this Guide, and other documents pertaining to the roles of public safety agencies in crisis relocation, can be of value in planning for general civilian evacuations.

Why Was This Guide Prepared?

A crisis relocation or other form of evacuation will obviously require the extensive involvement of public safety agencies. And, such involvement may require resources that are significantly beyond an agency's normal capabilities.

Additional resources may be required to:

- provide information/instructions for evacuating citizens
- direct traffic along an evacuation route
- protect property in the evacuated area
- provide services related to accidents, fights, fires, medical emergencies, etc.

How then can a local public safety agency meet these increased demands for services? There are two basic approaches to meeting workload requirements:

1. Reduce the demand
2. Increase the effective availability of resources within the agency and community.

This Guide contains simple techniques and procedures for use in estimating resource requirements, and for identifying alternative techniques for reducing resource requirements and increasing the availability of current research.

Who Should Use The Guide?

This Guide has been prepared especially for use by personnel of local government, law enforcement, fire protection, and rescue-medical agencies--and particularly for those involved in crisis relocation or general evacuation planning for these agencies.

What Will Result From Using the Guide?

The bottom line is--this Guide will assist public safety planners to estimate the types and quantities of resources required to support a crisis relocation or evacuation operation. It also identifies simple techniques which can be considered for reduction of the expected workload and related resource requirements. (For example, the resources required to protect extremely valuable items, such as jewelry, paintings, etc. could be reduced if these items were stored in a single facility.)

The Guide also includes suggestions for increasing the effective availability of resources which are currently within an agency or the community. For example, activities normally conducted by a public safety agency could be temporarily performed by a community service organization.

How Would The Guide Be Used?

It is expected that the Guide might be used in a cyclical mode; that is:

- 1) estimate resource requirements under normal procedures for the phases of an operation

- 2) compare requirements with availability to identify types and quantities of resources that are beyond current capabilities

- 3) select techniques for reducing workload requirements and increasing availability of current resources.

- 4) re-estimate resource requirements based upon decisions made in Step 3 above, and determine if expected workload demands can now be met

- 5) repeat Steps 3 and 4 as necessary to achieve a balance between expected workload and corresponding capabilities.

What Do These Crisis Relocation Terms Mean?

This Guide includes a few terms associated with crisis relocation which may not be familiar to public safety officials. These terms are identified and defined in the following paragraphs:

- Risk Area - a community which is (at least potentially) threatened by an extremely hazardous situation (e.g., natural disaster, internal threat, severe international crisis). From the standpoint of war-initiated situations, these communities will generally be:
 - metropolitan areas with central cities of 50,000 or greater population, and
 - areas containing certain important military installations.

- Host Area - a community to which residents of a risk area are relocated for the duration of the crisis situation.

- Crisis Relocation Operation - The entire process of planning and executing the relocation of the citizens of a given community, including information and instruction, relocation, host area support, and return to the risk area or resettlement to other areas.

- Evacuation - The process of physically relocating risk area residents to/from the host areas. (The risk to host area evacuation is expected to be carried out over a 72-hour period.)

- Public Safety Agencies - Those governmental agencies which are responsible for law enforcement, fire protection, and rescue-medical services.

- Rescue-Medical Services - Those sickness and injury-related services which are emergency in nature and are performed in the field (e.g., homes, accident sites, etc.), and the subsequent transport of the victim to an emergency care facility.

- Preparatory Phase - The planning phase prior to a relocation operation which includes: "normal" readiness during peacetime, increased readiness during international tensions and crises, and mobilization of emergency services upon advice from the State that a crisis relocation is imminent.

- Evacuation Phase - The phase (subsequent to the Preparatory Phase) which begins with an order to relocate the residents of the risk area, including maintenance and support of essential risk area production and service activities;

protection, support, and care of the relocated population in the host areas; and the orderly resumption of risk area occupancy and activity (upon an order to return).

- Attack Phase - This phase includes those activities which are required only if an attack warning or an actual nuclear attack occurs.

- Return Phase - This phase includes those activities which are required if no attack occurs, and relocated citizens are expected to return to the risk area.

- Resettlement - Those activities or events in the post-attack period that include movement of citizens from the original host areas to other available host areas.

- Critical Workers - Critical workers are those individuals who are required to maintain the production of essential goods and services in the risk area. For example:

- food processing plant employees
- public utilities employees
- public safety personnel.

SECTION 2

CRISIS RELOCATION AND EVACUATION SCENARIO

Introduction

A brief description of a crisis relocation operation in a hypothetical risk community is included to assist in an understanding of the concept and the general roles of public safety agencies. The scenario describes in narrative form the conditions which lead to a crisis relocation, as well as major activities of the operation.

This scenario is based upon information contained in previous crisis relocation research reports.

Background

An extremely severe international crisis exists which could involve the U.S. in a nuclear war. The President has announced a decision to relocate citizens of all risk areas, including the City of Wildview.

The City and surrounding host areas are prepared for this operation because crisis relocation plans have been developed by all of the involved public and private organizations. These plans specify the functions and responsibilities of the various agencies and individuals who are responsible for the relocation and subsequent return of citizens to their homes; or in the event of actual attack, the possible resettlement of citizens in other areas.

The relocation operation will attempt to relocate most of the citizens of Wildview. The City will not be searched for individuals who choose not to leave; however, if such individuals come to the attention of the authorities, they will be transported to the host

areas. Critical workers are the only people expected to be in the risk area after evacuation.

The Wildview plan calls for the relocation of approximately 80 per cent of the population of the risk area. It is expected that a certain portion of the relocation will be spontaneous--that is, individuals will relocate upon their own initiative to their own private destinations, such as the home of a relative or a vacation home. The relocation plan calls for the movement to take place over a three-day period, with an expected stay in the host area of two weeks.

Critical industries and services within the Wildview risk area will be maintained throughout the relocation period. Critical workers will commute from pre-designated host areas to their jobs.

The Wildview risk area and the surrounding host areas involve different political jurisdictions, so the activities of the corresponding public safety agencies must be coordinated throughout the relocation period.

For the duration of the relocation, personnel and citizens staying in the risk area remain under the jurisdiction of the Wildview government, while public safety personnel and citizens assigned to the host area come under the jurisdiction of the host area government.

The overall crisis relocation plan specifies that an adequate level of fire and police protection will be maintained in both the risk and host areas.

Even though an actual attack has not yet occurred, the National Guard will not be available to assist because it has been called to active military duty.

Evacuation

Wildview citizens will be relocated to host areas in the vicinity of the City. These host jurisdictions will have a permanent population of no more than 20,000 and will be located approximately 50 to 100 miles from the center of Wildview. The host areas will accept relocated citizens on a 2-to-1 ratio; that is, a given area will accept two new individuals for each permanent resident.

Relocation will be accomplished primarily by private automobile; each vehicle carrying approximately four persons. If a particular automobile does not have a full complement, authorities along the route will attempt to add individuals as possible; however, drivers will not be forced to take additional passengers.

Evacuation routes out of the Wildview area will be pre-designated, and will be equipped with traffic direction and control displays. A number of enroute assembly points will be designated for individuals needing transportation.

In addition, plans will be made for enroute fueling and minor automobile servicing. These services will be accomplished by increasing the delivery rate for fuel and supplies to pre-designated service stations along the route. Repair parts and service items will be restricted to those normally stocked by service stations.

Private automobiles will be supplemented by mass transportation vehicles.

Plans developed by the involved public safety agencies designate the specific location, capacity, and access routes for each host area. Routes will be two-way paved roads which will remain open in both directions.

Individuals will be given specific routes for travel to host areas. Upon arrival, they will check in at a reception center. If there is available space, the reception center will provide specific housing assignments; if the area is full, individuals will be directed to continue along the pre-designated route to the next host area. Travel will continue until available host area housing is located for all. (Risk area citizens with specific personal destinations will be allowed to go to such locations.)

Relocating citizens will be permitted to take some possessions with them, such as clothing, food, small valuables, and recreational items. Individuals will be asked to refrain from taking firearms or other weapons, alcoholic beverages,* or general narcotics (not associated with a prescription). Personal searches will not be usual; however, if contraband items come to the attention of the authorities, citizens may be searched, and, under appropriate circumstances, contraband confiscated.

Household pets will not be released in the risk or host areas. Neither food nor water will be specifically provided for pets, since first priority will be the safety and well-being of citizens.

*Alcoholic beverages for personal use will be permitted--excessive amounts will be confiscated.

Critical Workers

Critical workers needed to keep essential industries and services in operation have been identified within the crisis relocation plan, and will be given a suitable identification card. Lists of critical workers (names, home addresses, phone numbers, etc.) have been maintained by employers and, upon the decision to relocate, will be given to the appropriate authorities.

Critical workers have been assigned to special host area housing close to their Wildview jobs (within 50 miles). They will be able to commute daily to their jobs. Essential industries and services will be operated in 12-hour shifts, requiring only two commuting cycles per day. Commuting will be by mass transit (e.g., bus or train), rather than private automobile.

Information Dissemination

All citizens of Fairview have been notified that a relocation is planned. Notification media include radio, television, and newspaper. Specific written relocation information will be provided directly to citizens. Instructions or route designations will be supplemented via radio and TV.

Such information is being distributed in two ways:

- a. Evacuation information, including specific instructions and route designations, will be printed in newspapers.
- b. Evacuation information will also be distributed door-to-door by relocation operation workers.

Detailed relocation instructions have been organized according to telephone number prefixes; that is, all citizens within a given area served by a specific central telephone office have a unique route designation. Instructions do not specify a particular host area to which persons must go, but rather the route they must follow until they find a host area with available facilities. Members of organizations (e.g., professional, social, religious) may relocate, as a group, to pre-designated host areas.

Relocation instructions state that citizens should use automobiles (if in good working order). Citizens are encouraged to invite neighbors and friends to travel with them, so that every vehicle will carry the maximum number of passengers. Relocation instructions specify items that can be taken to the host area and, very specifically, items that are not permitted.

Individuals who do not have their own private means of transportation have been instructed to attempt to obtain a ride with a neighbor or friend. Specific instructions for using public transportation have also been provided, i.e., assembly locations and departure times.

Host Area Housing

Host area residents will be encouraged to accept risk area citizens into their homes, but will not be forced to do so. Individuals who are not invited into private homes will be housed in public facilities, such as schools, churches, motels, bowling alleys, etc. (It is expected that some individuals will arrive with their own housing in the form of campers or trailers.)

Host area residents and "guests" will need fallout shelters. Relocated personnel will be instructed to immediately help upgrade existing fallout shelters and to construct expedient shelters where necessary.

Return to Risk Area

Under no circumstances will relocated personnel (not designated as critical workers) be allowed to return to Wildview prior to the official announcement of a decision to return to the risk area.

When officials have declared that it is safe to return to the risk area, they will implement plans which have already been prepared for this purpose. At this time, detailed return instructions will be provided to the relocated personnel in each host area.

SECTION 3

EVACUATION DEMANDS

The first step in planning for resource requirements is to acquire an understanding of the demands that will be placed upon public safety agencies. In general, these agencies will be required to perform two basic types of functions:

- a) Fundamental Functions - those inherent in the charter of an agency. (For example, a fundamental function of a fire department is the suppression of fires.)
- b) Ancillary Functions - those additional functions performed as a public service.

What is the General Role of Public Safety in Crisis Relocation?

Public safety is one of the more critical aspects of a crisis relocation operation. Public safety agencies have primary responsibility for the actual movement of citizens, as well as the protection of life and property. Thus, these agencies may individually experience a significant increase in workload due to:

- an increased level of activity, e.g., traffic direction and control, guarding business establishments, fire prevention.
- an increased level of incidents, e.g., accidents, fights, fires, medical emergencies.

Law Enforcement?

One of the most difficult of all CR tasks is that of law enforcement agencies--controlling the actual evacuation of a city's population. This responsibility involves the majority of relocation functions, and proper planning for these functions is essential.

Law enforcement agencies must also operate outside their realm of normal experience, performing such services as protecting an almost vacant risk city, while simultaneously coordinating the provision of services within an overcrowded host area. Personnel must be prepared to handle numerous situations for which there may be no precedent.

Major or critical law enforcement functions identified as a result of CR research include:

- a. institute revised law enforcement policies
- b. establish security patrols
- c. support staging areas
- d. protect critical facilities
- e. operate traffic control system
- f. protect personal property
- g. provide storage for valuables

h. confiscate contraband

i. assist disabled motorists

j. provide for relocation/utilization of prisoners

k. disseminate information

l. relocate families of law enforcement personnel

m. transfer designated resources to host areas.

Fire Department?

Similarly, unusual circumstances and duties will undoubtedly challenge fire service personnel--perhaps the most obvious requirement is the provision of fire protection to a city without people. People are the primary cause of fires, as well as the source of fire detection. Without people, there will be fewer fires, but those that do occur are likely to be in an advanced stage before discovery--this delayed detection can be disastrous unless departments are aware of the threat and plan accordingly.

Careful planning is also required for fire protection activities in the host areas. Personnel of one area may be unfamiliar with another's jurisdictions, dangers, procedures, etc., and efforts must be made to provide advance information to assisting departments. (Fire protection personnel must assume a personal responsibility for ensuring that overcrowding does not occur and that fire exit drills and general fire safety are practiced throughout the host area.)

Major or critical fire protection functions include:

a) institution of revised fire protection policies and procedures appropriate to each phase of the operation

b) provision of fire suppression services in accordance with adopted policies and procedures

c) initiation of fire detection patrols

d) operation of special fire prevention programs appropriate for each phase of the relocation

e) transfer of designated resources to host areas

f) support of staging areas

g) provision of enroute fire protection

h) provision of special fire protection for critical industries

i) provision of protection for apparatus (should attack be imminent)

j) assistance in disseminating information

k) relocation of families of fire protection personnel.

Rescue-Medical Services?

Anxiety, tension, and restlessness may lead to a number of medical emergencies, such as:

- increased incidence of illness, especially among elderly persons who have a history of respiratory or heart ailments

- fighting among citizens, resulting in a requirement for first aid
- automobile accidents during the evacuation and return phases.

There will undoubtedly be an overwhelming demand upon medical supplies. Rescue-medical services personnel must anticipate these emergencies, and properly plan to meet the demands.

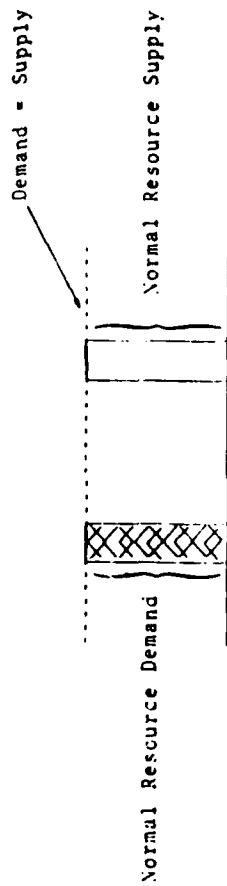
CRP research has resulted in the recommendation that rescue-medical service functions be included with those for fire protection agencies, based upon the fact that fire departments are frequently responsible for such services. Exceptions to this condition occur in a few cities where the rescue-medical services are provided by the police department, a hospital, or a private agency. Even in these cases, the fire department usually responds to emergency injury and sickness incidents--especially those involving rescue operations.

In communities where this service is not normally provided by the fire department, the functions might be completely assumed, shared, or, at least, coordinated by the fire department.

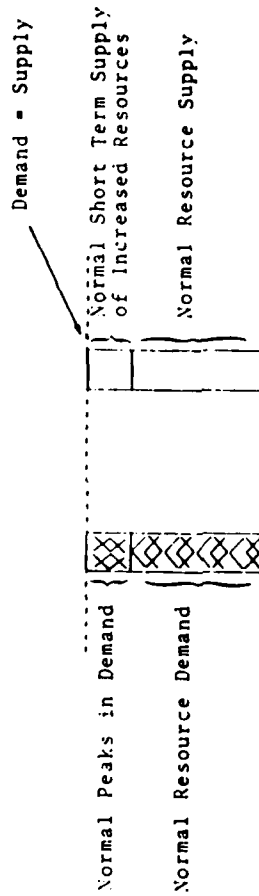
Major or critical rescue-medical functions include:

- a) increase overall rescue-medical capabilities (i.e., increase personnel, equipment, and supplies) in the risk, enroute, and host areas
- b) increase inventories of emergency medical supplies, including oxygen
- c) assist in alerting and evacuating patients in hospitals, nursing homes, etc.

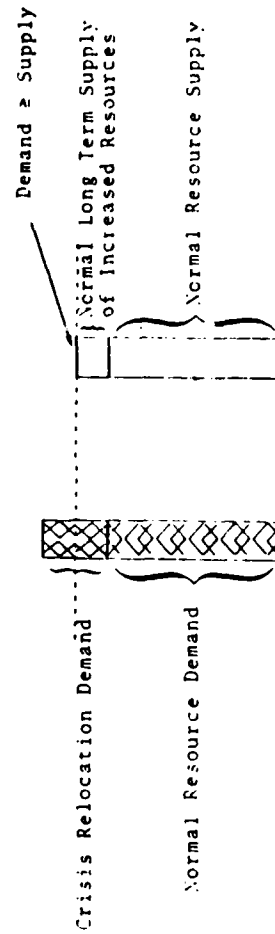
- d) implement overall response screening procedures to ensure that resources are applied only to emergency situations
- e) provide general dissemination of information
- f) relocate families of rescue-medical personnel
- g) transfer designated resources to host areas.



A. Comparison of resource demand to resource supply under normal conditions.



B. Comparison of normal and peak resource demand to normal and short term resource increases.



C. Comparison of normal and crisis relocation demands for resources to the normal and long term supply of resources.

Figure 1. COMPARISON OF DEMANDS ON PUBLIC SAFETY RESOURCES TO SUPPLIES OF RESOURCES

SECTION 4

WORKLOAD REDUCTION METHODS

The demand for public safety resources will be reduced and brought into balance with the supply of resources by using workload reduction methods. Figure 1 shows the balance situation during: (1) normal pre-crisis relocation emergency conditions, (2) normal peak pre-crisis relocation emergency conditions, and (3) emergency crisis relocation conditions. In Figure 1(A), routine resource demands are met by normally-available public safety resources, resulting in supply/demand balance. In Figure 1(B), peak resource demands are met by using readily available short-term means, such as:

- (a) temporarily increasing manpower by instituting overtime service or by recalling off-duty personnel
- (b) implementing changes in operating procedures which divert field officers from the handling of routine activities to critical activities only
- (c) activating reserve or special equipment (to be supplied under contracts with private enterprises, such as ambulance companies)
- (d) activating mutual aid agreements with other public safety organizations.

Figure 1(C) illustrates the condition that might occur when the demand for services exceeds available resources for an unacceptable period of time.

Workload reduction methods can be accomplished using the following practices to achieve a balance between resource supply and demand:

- implement measures to reduce the frequency of specific public safety incidents, i.e., eliminate the demand for a specific public safety response through public education, etc.
- transfer the responsibility for selected functions to other organizations; for example, traffic accidents might be handled by members of a service club
- establish a priority for each life safety and property protection activity and adjust the provision of these services according to the level of the service demand; that is, when the demand for service exceeds the supply, eliminate the provision of lower priority services
- modify operating procedures so that optimal time and activity are expended on each incident. (For example, the "knock-down and move-on" fire fighting tactics employed by the Los Angeles City Fire Department during the Watts Riots.)

*The so-called "knock-down and move-on" fire fighting technique emerged as a means of meeting the unusually heavy fire protection demands of the Watts Riots in Los Angeles, California in the 1960's.

Assumptions Affecting Workload Reduction

The workload reduction methods contained in this Guide are based upon the following assumptions:

- (a) the risk area population is one which is willing to be relocated
- (b) host area residents understand the gravity of the situation and will cooperate in the relocation operations; that is, they will allow risk area persons to settle in host area communities
- (c) the actions of persons involved in crisis relocation operations are more predictable when they believe that governmental officials have the ability to handle the emergency; that is, the risk area populace must feel assured that there will be adequate relocation facilities in the host area, and that their vacated homes and possessions in the risk area will be protected
- (d) the criminal justice system (law enforcement, city and county attorneys, public defenders, judiciary, probation and parole personnel, etc.) have pre-planned and coordinated their activities in order to provide reasonable service in the risk area and the multiple host areas
- (e) private security and alarm companies will continue to maintain service contract obligations (it is assumed that such businesses will be judged to be critical)
- (f) private and public maintenance services normally employed for public safety facilities and equipment (vehicles,

communications equipment, and other special equipment) will continue to be provided throughout crisis relocation operations.

When the demand for resources is expected to exceed supply, action must be taken to either reduce the demand or increase resources. Methods have been identified which can lead to reductions in demand, or increases in the effective availability of resources--these methods are collectively referred to as "Workload Reduction Methods".

Workload reduction methods included in this Guide are simple, straightforward activities; many are "just good common sense." These methods may be familiar to public safety professionals and currently used in major emergency situations. This Guide will assist in the systematic consideration of the methods, serving as a reminder to those who are familiar with the methods and introducing them to those who might not think of a particular approach to workload reduction.

Description of Methods

General Methods

This section describes those workload reduction methods which apply generally to law enforcement, fire protection, and rescue-medical services.

(a) Public Education and Information

The actions or inactions of people constitute the demand for public safety resources. Public information and long-term public education techniques offer a challenge and an opportunity to prepare the public for such an emergency.

To ensure the success of crisis relocation operations, people should have a basic understanding of their roles and responsibilities. In order to educate citizens in this area, the following CRP information should be made available:

- (1) general objectives of the crisis relocation program
- (2) an understanding of the local CRP and the roles and responsibilities of individuals under the plan
- (3) the location of detailed CRP information and the manner in which it is to be distributed
- (4) steps people can take to secure their homes and other properties while relocating.

The education and information program should be in three phases: the first would be directed toward informing the people of CRP, and their respective roles in the plan. (One of the goals of public education should be to make the major concepts and key provisions of CRP common knowledge. This information could be interwoven into the programs of social organizations [service clubs, Scouts, etc.] and into public and private school curricula.)

A second phase would periodically introduce the public to the relocation planning concepts and provisions in a more specific fashion than that used in Phase 1. A practical step under Phase 2 would include the presentation of public service announcements (PSA) on television and radio, as well as the distribution of appropriate printed matter containing a simple instruction sheet for posting within the home. Programs such as these should explain the rationale for CRP instruction.

The third phase would take place at the onset of international tensions judged significant to warrant consideration of crisis relocation operations. This phase would dispense specific instructions tailored to implementation by either risk or host area residents.

Historically, the quantification of workload reduction due to public education and information programs has proved difficult to determine; however, the principal impact of this program would be the reduced demand on public safety resources through improved actions of an informed public.

(b) Relocation of Public Safety Families

A sense of well-being is an important factor in the availability and performance of public safety people--a person will be more willing and able to carry out assigned duties when he or she is secure in the knowledge that loved ones are safe.

There are two major questions concerning the location of families:

- (1) Where should the families of personnel assigned to the risk area be located?
- (2) Where should the assigned persons, themselves, be located?

Research has concluded that people assigned to risk area duty would prefer to have their families located well beyond the safe 2 psi over-pressure area. Furthermore, it has been concluded that it is neither necessary nor desirable for risk area personnel to be intermixed with those in the host areas. The rationale for this conclusion is that a risk area worker in contact with his family in the host area may tend to be demoralized and may refuse to return to duty. (The cause of this action could lie in the family's expression of what would seem the patent

unfairness of having a loved one repeatedly exposed to the possible nuclear hazards of the risk area.) The disruptive influence of personnel, either not reporting to duty or being preoccupied while on duty, could diminish the overall effectiveness of risk area public safety units.

A useful technique for ensuring the continuous supply of available resources follows:

- locate the families of risk area personnel sufficiently far from this area to assure their safety in the event of a near-miss explosion
- locate all public safety personnel assigned to the risk area as close to their duty stations as possible. (If sufficiently-hardened sites exist within the risk area, these could be used for both on-duty and off-duty forces.)

Several positive benefits could result from locating personnel close to their duty stations. First, supervision of all personnel assigned to the risk area would be simplified, and the strength of the force could be more easily estimated from shift-to-shift. Secondly, the close proximity of off-duty personnel would permit scheduling fewer on-duty people, since members of the off-duty crew could be assembled easily and quickly. If necessary, and time permits, reenforcement could also be made from the host area.

The separation of public safety personnel from their families creates a need for special off-duty housing through:

- provision of sufficiently-hardened housing to withstand greater blast overpressure within the risk area, or

- standard housing apart from dependents, and just beyond the 2 psi overpressure area.

(c) Restructuring of Public Safety Resources

It is clear that a significant restructuring of public safety organizations, indeed the entire community, will be required to successfully accomplish a crisis relocation operation. Perhaps the most significant workload reduction method is the realistic exercising of the procedures and mechanisms devised to carry out the operation. If non-routine procedures are required, citizens and public safety personnel should be prepared to act accordingly. However, to the extent possible, the crisis relocation procedures should be identical to those used on a routine, day-to-day basis, since the introduction of non-routine procedures would almost certainly result in a greater workload.

The essential functions to be performed by public safety organizations during crisis relocation were identified in Section 3.

The restructuring of two features of the operation are mandatory:

- (1) provide for command at the regional level (risk, enroute, or host areas)
- (2) establish command at the local level (risk, enroute, or host areas).

For both command types, three basic revision techniques must be applied:

- (1) reorganize the force structure
- (2) concentrate forces tactically

(3) revise tactics to

- redefine incident responses
- prioritize incident responses
- adopt minimum levels of service.

(d) Assignment of Public Safety Personnel

To maximize the efficiency of public safety resources, the following assignment techniques are recommended:

- assign the most critical or stressful tasks to personnel with known excellent performance records
- pair persons of unknown or less performance records or of doubtful ability with those of superior performance
- minimize the rotation of personnel.

(This action would eliminate the constant need for instructing untrained persons, and would maximize the efficiency of performing such specialized tasks as anti-looting and critical installation patrol.)

(e) Improved Command

The key to successful, efficient (minimum workload) public safety operations is decisive action emanating from clear lines of command. Basic to an improved command is a definition of jurisdictional control of public safety resources within designated risk and host areas. For example, there may be several fire jurisdictions included within a risk area. The command structure developed for the area will greatly influence the resources thought to be needed within the area, and, thus, the resources which are made available for transfer to outlying host areas.

Two levels of command are necessary to carry out command functions within the risk/host areas. First, at the local or area level, there is a need for command posts to govern the action of all resources. To the extent possible, the law enforcement, fire protection, and rescue-medical resources should be controlled from a central location where local command personnel are empowered to coordinate needs and resources. Regardless of location, adequate communication links between all operating resources and higher-level command posts are essential.

Second, a higher command structure, such as an Emergency Operations Center (EOC), should be established to control the combined risk and host area crisis relocation operations. The EOC will concern itself with overall operations; that is, it will ensure that available resources are efficiently applied to priority tasks throughout the areas.

Law Enforcement Methods

The workload reduction methods which have been developed for the law enforcement public safety subfunctions are contained in this section.

(a) Restructuring Law Enforcement Operations

The demands for crisis relocation require a restructuring of the operations plans of the law enforcement agencies to reduce workload levels in the risk area, the host areas, and on the relocation routes. Major workload reduction features of the restructured plans follow:

- (1) Changing the work shifts of 24-hour coverage positions from 8 to 12 hours, by cancelling all leaves and special assignments, by using non-departmental personnel, and by reassigning support personnel occupying less than 24-hour

coverage positions to 24-hour coverage positions. Changing the shift hours, alone, will increase the 24-hour coverage personnel complement by approximately 50 per cent per work shift.

(2) Releasing minor offense prisoners and other carefully-chosen non-felony confinees, relieving those responsible for prisoner custody to assume other law enforcement assignments--some prisoner manpower would then be available for selective crisis duty. The release of prisoners would, of course, have to be in accordance with the provision of restructured requirements of the criminal justice system.

(3) Relocating and consolidating felons, thereby relieving law enforcement personnel for other duties. Actual planning for the movement of prisoners should proceed with little difficulty, since the number of prisoners does not vary greatly over a period of time, and prisoners are a captive group subject to the will of the authorities.

(4) Redefining violations and handling procedures in accordance with revised departmental policy and criminal justice system requirements.

. Priorities should be established and a schedule developed for redefined violations. (For example, a Schedule 1 priority would be assigned the highest priority; that is, a violation that would always be serviced. A Schedule 2 priority would be

served only if there were no pending Schedule 1 priority violations. Schedule 3 priority violations would be serviced last.)

. A number of routine procedures could be either suspended or modified. (For example, the suspension of automatic response to fire alarms; the serving of summons (civil), misdemeanor warrants, and arrest warrants; and prosecution of low-grade felonies.) The number and nature of field releases could be increased. (For example, a suspension of the handling of drug overdose cases, narcotics violations, and related situations would reduce the field workload.)

Another advantageous procedural change could be an increase in the use of telephone reports of unlawful incidents (to gain case histories), instead of sending officers to the scene of the crime.

(5) Revising patrol assignments in the risk area in order to reduce workloads for patrol functions. (For example, designated critical installations could receive the greatest surveillance, with special response capability for solving serious problems, such as disruptive groups threatening the security of the installation.)

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(6) Using lightweight, slow-moving, fixed-wing aircraft or helicopters to perform patrol. These aircraft could be equipped with two-way radios linked to the area command post (CP). (The use of steerable searchlights beneath helicopters would enable these craft to fly patrols over the risk area on a 24-hour schedule.)

Throughout the risk area, the roofs of vehicles and clothing of personnel could be distinctively marked using highly-reflective spray paint or other easily visible means in order to facilitate the airplane patrol in identifying legitimate risk area personnel--irregularities could then be reported to the CP for disposition.

Aircraft might be procured through such sources as the Civil Air Patrol, commercial aviation, flying schools, etc. In instances where aircraft are used in law enforcement work, spotters aboard these aircraft would be in an excellent position to detect and report fires to the CP.

(7) As supplements to the airborne patrols, or in some circumstances, in lieu of them, there are several land-based patrols which are necessary in both the risk and host areas. These land-based patrols include: anti-looting, critical installation, and broad residential patrols, as well as special problem response capability.

(b) Prioritizing Calls for Service

A workload reduction method applicable to law enforcement is that of prioritizing violations reported by telephone. Calls for law enforcement assistance could be ranked according to a pre-planned priority sequence and field responses would be made only for emergency situations.

High priority crime eliciting an immediate service response will include various categories, such as: robbery, burglary in process, major disturbance of the peace, or a police officer requesting assistance. Examples of lesser events with a lower priority are: neighborhood or family disputes, narcotics/drug/neighborhood incidents, shots fired in some unknown drunkenness incidents, missing persons, mental cases, trouble situation, stolen vehicles, burglary/theft from a vehicle, lost or found property, etc.

In the risk area, requests for law enforcement action would be much less diversified than in the host area during the population movement stage, and especially after the bulk of the population had been relocated. In the host areas, there would be a measurable increase in law enforcement needs; therefore, prioritization relates to the types of immediate responses to be made and the assignment of personnel among risk and host areas at any given time.

(c) Developing a Crisis Relocation Traffic Control System

The problems associated with moving large populations have been largely defined in Reference 9. The crisis relocation traffic control system could be designed in accordance with Reference 3. (See Page 16a above)

A steady flow of vehicles is essential. Vehicle movement must be maintained with minimum disruption, and according to the pre-planned schedule.

When a relocation highway is being used for movement of the population, it may be operated as Class "B"; that is, highways which are temporarily reserved exclusively for a special use, such as military or civil defense. (Users of these routes would not need "Road Use Permits.")

The movement of large numbers of vehicles over a 72-hour relocation period would increase workloads for all public safety resources. The load volume would

depend in large part upon the capacity of highways to carry not only the civilian traffic, but, in many cases, military traffic, as well. The primary and obligatory role of the traffic control system is to keep traffic moving.

The use of aircraft (light, fixed-wing or helicopter) and motorcycles could be advantageous in maintaining traffic flow and moving traffic control personnel in congested areas. These aircraft could be used to monitor traffic and to direct ground personnel to points of congestion. (As a rule of thumb, the California State Department of Transportation uses a measure which states that for each one minute of traffic tie-up, 10 minutes are required to clear the resulting traffic jam.) As mentioned previously, aircraft and qualified pilots should be readily available for air patrol in order to assist in clearing up congestion situations, as well as other duties.

As in normal traffic control situations, motorcycle patrols could be advantageously utilized in the relocation movement. In addition to the regular law enforcement equipment, motorcycles could be obtained from dealers or citizens. Machines not equipped with radios could be made a part of the communications system by the addition of portable public safety or Citizen Band Radios and the use of a commercial broadcast station in communication with the portable broadcast receivers. Traffic control messages and general interest crisis news releases could be interspersed with other programming. The establishment of adequate CB radio networks along highways would facilitate the relay of messages to the network controllers. All network controllers would be volunteers, thereby lightening the workload of public safety resources personnel. Since CB radios are in widespread use and many police units customarily monitor these channels, a command post could easily incorporate communications into the existing system.

The Radio Emergency Associated Citizens Teams (REACT) located throughout the nation are presently assisting public safety agencies with highway-related situations on an hour-to-hour basis and will be an invaluable asset to the crisis relocation operation.

The essence of good traffic control is to keep the traffic flowing without regard to ultimate destination. To facilitate flow during relocation, a method is required to control traffic allowed onto the highways; (i.e., prevent traffic saturation) and to maintain reasonable flow rates. The location for control of traffic gating may be at any allowable traffic entry point. This would indicate that relocation highways could be converted to limited access routes, at least during relocation. In risk areas, most entry points could be blocked off using whatever means available (trucks, cars, etc.) and traffic control personnel with communications capability could be positioned at strategic locations.

When using the above method, traffic jams would most likely occur in risk area streets, rather than on relocation highways.

The utilization of similar traffic control procedures would be necessary at relocation route (relocation traffic service facilities) staging areas or highway intersections. Short-term vehicle parking at the staging areas should be sufficient to accommodate those pulling in for emergency service.

(d) Restricting Sources of Alcohol

With the increased population in the host areas, it is reasonable to assume that many people will have considerable idle time, too much ready money (at least initially), and feelings of traumatic uncertainty and fear. As in other crisis situations, some will undoubtedly seek a solution by over-consumption of available alcohol. If left uncontrolled, this

response could lead to fights and civil disturbances, resulting in additional demands upon law enforcement personnel. Therefore, consideration will be given to restricting sources of alcohol, to both commercial establishments and private citizens. In addition, it will be prudent to control the use of alcoholic beverages by critical workers in the risk area (i.e., they should not drink on duty).

(e) Developing Methods for Storage of Valuables

Although arrangements for public storage of valuables in the host areas are desirable, excessive demands upon public safety manpower could result. The items to be stored must be limited to those of high intrinsic value and low physical volume. Definitive methods for receiving, identifying, packaging, storing, and returning valuables to the rightful owners must be developed and publicized as part of the pre-crisis planning procedures.

Fire Protection Methods

The workload reduction methods applicable to fire protection are described in this section of the Guide.

(a) Restructuring Fire Protection Operations

Fundamental structural changes in public safety resources in both risk and host areas are necessary to accommodate the changing demands on these resources. This restructuring must include the resources of every public safety agency and organization having jurisdiction in and between the risk area and its host areas. In all geographic areas, fire protection resources must be restructured to improve utilization of personnel and equipment. The major features of such

restructuring in areas for which planning is needed are itemized below:

- establishment of fire protection command posts (CP's) in risk and host areas
- establishment of liaison between the CP's and the Emergency Operations Center (EOC)
- revision of work shifts and personnel assignments
- definition of fire prevention, detection, and suppression strategies
- assignment of fire protection resources.

(b) Revising Work Shifts

The revision of work shifts is a useful technique for increasing the supply of personnel in order to meet demands. As a result of this technique, an increased number of personnel will be available to man reserve equipment, increase apparatus manning levels, accomplish fire prevention tasks, and establish fire detection patrols. By reducing three shifts to two, allowing for cancellation of leaves, and shutting down non-essential functions, the per shift 24-hour personnel coverage levels could be increased by approximately 50 per cent. (Some fire chiefs may prefer to maintain the traditional 24-hour shift, while others may prefer a 12-hour shift--either shift arrangement will favorably coincide with the transportation arrangements planned for relieving risk area critical workers; that is, to relieve on-duty risk area personnel each 12 hours.)

(c) Developing New Criteria for Selective Dispatch Assignments

Fire departments traditionally commit a full apparatus assignment to each alarm which is judged to be valid. However, some departments do dispatch a short assignment for a size-up before committing the full pre-planned assignment in instances where the location is a known "high false alarm box." The traditional "running" cards which are used to determine an assignment for a particular address or alarm box location have been deemed inadequate during the crisis relocation process. In order to reduce the unnecessary workload that would be created by the use of these obsolete or inadequate assignment cards during crisis relocation conditions, new criteria must be developed to guide selective assignment planning.

(d) Centralizing Resources

When the risk area population and fire protection resources have been reduced, fire fighting strategies must be developed to provide the redefined levels required. By closing non-essential fire stations and, where possible, manning apparatus to engine company status, equipment can be unified into the powerful task force* response posture. Such capability will be necessary to quickly knock down residential fires which have reached advanced stages.

*The Task Force Concept was developed in the 1960's during the Watts Riots in Los Angeles, California. This concept is one in which multiple apparatus (adequately configured, manned, and equipped) are organized to respond to most fires, as a self-sufficient force not requiring outside help.

(e) Utilizing the Knock-Down and Move-On Method

The fire task forces used in the Watts Riots often reached burning structures only to discover that there was no opportunity to save the structure of fire origin or that there were too many fires to permit the application of ordinary fire fighting procedures. A method referred to as "knock-down and move-on" was employed by these task forces to maximize the utilization of fire fighters. These task forces were powerful units with sufficient manpower and apparatus to effectively and simultaneously set up fire defenses capable of protecting buildings from exposure to adjacent structure fires, and, then, to bring fires quickly under control. As soon as the fires were knocked down or brought under control by the fire fighting assault, the lines were picked up and the task force moved on to the next fire. Master streams were the order of the day and emphasis was shifted to conflagration control. While using this method, fire fighters abandoned the niceties of traditional fire fighting, including:

- major concern for saving the structure of fire origin
- salvage
- overhaul.

The exclusion of these three items represented a significant reduction in workload when compared to traditional fire fighting methods.

(f) Using Aircraft and Light-Weight Vehicles for Traffic Control

The method of using aircraft and motorcycles for traffic control workload reduction (as described in Item (c), Developing a Crisis Relocation Traffic

Control System, of the "Law Enforcement Methods" Section) is equally applicable to fire reporting along the relocation routes.

Whenever possible, the use of lightweight vehicles (such as pick-ups) outfitted with chemical fire extinguishers or a booster pump and small water tank is preferable to the use of full capability fire engines--the lighter vehicles are more maneuverable than large engines and can be used for other traffic-related purposes.

(g) Providing Public Education and Information Concerning Leaving Structures in a Fire-Safe Condition

The most important step in reducing the fire protection workload in the risk area is to prevent the occurrence of fires. Homes and other structures left improperly secured at the time of the occupant's departure will be a potential fire hazard and may impose a heavy demand on fire resources. A public education program, specifically directed toward the problems and solutions of vacating a fire hazardous structure, would enhance other efforts to lessen the demand on fire protection resources.

In the risk area, there is an expected 72-hour transition period during which the fire incident rate would be expected to decrease to the steady state of an almost vacant city. Human-caused fires in vacant areas should stabilize in approximately 12 hours following completion of the transition period. Many fires that do occur will originate from careless human actions or inactions which have delayed time effects; for example, a frying pan left unattended on a kitchen range or combustible material left in contact with a light bulb. After the transition period, a continued level of fire danger would exist in previously-vacated structures as a result of electrical/mechanical equipment failure, spontaneous combustion, etc.

To alleviate human-induced fire incidents and protect properties from intense nuclear thermal radiation, there are several citizen-oriented fire prevention measures that should be stressed in the pre-crisis relocation education effort:

- Disconnect all electrical appliances, with the exception of refrigerators containing perishables, and furnaces (during freezing weather). Where possible, it is recommended that all electrical power be turned off at the main distribution box.
- Reduce the thermostat setting to a minimum level for all heating equipment. Turn off all manually-controlled space heaters. Where possible, secure all gas supplies at the meter or at another outside cutoff.
- Turn off all gas-operated appliances at point of connection, with the exception of furnaces (during freezing weather)
- Close heavy window drapes, shutters, and blinds, and remove all lightweight curtains and drapes from windows to minimize the danger of radiant heat from either a nuclear explosion or an adjacent structure starting a fire inside the exposed structure. (Other window treatments which may prevent temperature radiation from entering through windows include the use of opaque materials, paint, or whitewash, or covering the windows with plywood or other heavy material.)
- Remove all loose paper and other such materials from the path of light through the windows. (These items may catch fire due to radiation from a nuclear explosion or from a fire in an adjacent structure or brush.)

(h) Developing Innovative Means of Detecting and Fighting Fires

Innovative means of detecting fires in the risk area would be needed to reduce the workload required to maintain adequate fire watch patrols. The use of fire watchtowers (or lookouts) is one such innovation which appears to have application to CRP. A special structure or watchtower would not be required, rather, lookouts could position themselves atop the highest building or natural land feature in an area (identified on previously-distributed maps). With binoculars and portable radios, fire watches could spot and report the presence of smoke by day and flame by night. This watchtower concept could supplement other patrol efforts, such as the airborne patrol discussed earlier.

Another innovative means of fighting fires is the use of mobile cement mixers to transport water. These mobile mixers would be in supply during the emergency and they are well-constructed for moving and quickly dumping relatively large volumes of water into portable water tanks. Use of these mixers and non-fire department drivers could assist the fire suppression effort in the transporting of water from one fire site to another and by serving as portable storage tanks. Other types of tanker trucks could be used, but their ability to make rapid dumps is generally less than that of the mixers.

Rescue-Medical Methods

The workload reduction methods which have been developed for the rescue-medical subfunctions are contained in this section:

(a) Restructuring the Emergency Medical System

Restructuring personnel and equipment assignments to meet changing demands is fundamental to the use of workload reduction methods applicable to the Emergency Medical System (EMS) or to any public safety system. Some practical methods of restructuring are the following:

(1) increase the supply of EMS personnel by dividing highly-trained technicians into several teams and combining them with lesser-trained or volunteer personnel

(2) achieve more efficient use of existing mobile intensive care units by supplementing them with less-sophisticated ambulances manned by expanded EMS personnel sources. The ambulance units could be of the following configurations:

- First Aid Vehicle - (station wagon or van) manned by an Emergency Medical Technician (EMT) and a civilian volunteer (limited to rendering first aid and not readily used to transport victims).

Ambulance equipped with necessary telemetry and other sophisticated apparatus to provide intensive on-site care for victims of heart attack, cardiovascular conditions, and heavy trauma; manned by either two EMT-3's (paramedics) or one EMT-3 and one EMT-1.

- Airborne Mobile Intensive Care Units - helicopter or light-weight, fixed-wing aircraft equipped with necessary telemetry, etc., to provide intensive on-site care for victims of cardiovascular conditions or heavy trauma; manned by either two EMT-3's or one EMT-3 and one EMT-1 (for use in remote or otherwise inaccessible areas, such as an enroute area traffic jam).

(3) gain more efficient use of the expanded ambulance fleet by forming a remote triage at the EOC or area CP to assign vehicles on the basis of reported symptoms. This procedure would greatly assist personnel in assigning the proper mobile resources to specific emergency medical incidents, and would minimize either an over- or under-response. The remote triage could be composed of a physician(s) or a highly skilled paramedical person(s). Although these individuals would be highly trained in the medical field, they would also require training in the proper procedures under this program. To protect these EMS personnel, the laws defining the responsibilities of physicians and paramedics to their patients would of necessity have to be amended or suspended for the duration of the crisis.

(4) prevent unnecessary transportation of victims, by legally permitting greater latitude in on-site care handling by the EMT's

(5) regulate, by amendment or suspension of restrictive laws or policies, the levels of immediately-available medication and supplies commensurate with the mission of the particular ambulance type.

(b) Inventory of Medical Facilities

An inventory of medical facilities, including number of beds, qualified personnel, specialized equipment, and admission procedures, should be available at the EMS dispatch points, so that time will not be wasted in determining the nearest first-aid station or hospital equipped to handle the medical emergency. Communications centers would issue periodic bulletins in order to optimize the assignment of ambulance units and to control transportation of patients to the most appropriate facility.

(c) Public Education and Information

A public education program designed to provide information regarding the availability and location of emergency medical services would reduce the workload that might otherwise fall to traffic control or fire personnel. For example, the distribution of printed matter, posted signs, and broadcast announcements would allow motorists to move directly to an available first-aid station without stopping to make inquiries of public safety personnel.

Public information media would also educate people as to the triage dispatching procedures, thus assisting in a more efficient operation in this area.

SECTION 5

RESOURCE REQUIREMENT ESTIMATION TECHNIQUE

Introduction

These procedures are designed to help you assemble information about your community and public safety departments which can be used to calculate the estimated number of personnel required for the various phases of a crisis relocation operation.

Relationship of Departmental Plans to Community Plans

Crisis relocation plans developed for the community level contain the following kinds of information:

- (a) identification of risk areas and corresponding host areas
- (b) assignment of portions of the risk area population to specific host areas
- (c) identification of relocation routes
- (d) the evacuation schedule
- (e) identification of critical industries in risk area
- (f) assignment of responsibilities to community departments
- (g) development of alerting schemes.

Department-level plans are designed to meet all assigned responsibilities identified in the community-level plan and under provisions of other applicable governing laws, ordinances, etc. Although the community-level plan may identify relocation routes,

and corresponding users of these routes, it is the responsibility of law enforcement, fire protection, and rescue-medical agencies to carry out the actual relocation; therefore, corresponding plans at an appropriate level of detail are required at the departmental level.

Purpose/Limitations of Guide

This Guide was prepared to assist local officials in planning for public safety resources in a crisis relocation context. Three separate models are provided for allocation of law enforcement, fire protection, and rescue-medical resources. Procedures have been included for obtaining the resource requirements by using either manual or semi-automatic means. (Semi-automatic operations require the use of computers capable of executing programs written in the Common Business Oriented Computer Language [COBOL].)

Limitations/conditions to using the models include:

- an understanding that the models, procedures, and computer programs are merely tools intended for use in departmental-level crisis relocation planning efforts
- the realization that model results are estimates and that specific knowledge of the local situation must be applied
- a clear understanding that only one public safety function (fire protection, law enforcement, rescue-medical) in either a risk or host area is considered at a time

the knowledge that procedures do not address the distribution of resources (personnel) among the risk and host areas, with the exception of indicating estimated surplus or shortage by area; again, local knowledge and additional planning are required to determine command and control methods.

The allocation models provide a means of easily and quickly testing the effects of different planning considerations upon public safety service demand, and the corresponding resource requirement.

General Description of the Models

The three resource allocation models contained in this Guide are designed for use by planners who are preparing crisis relocation plans at the departmental level of activity.

Each allocation model is independent of the other; that is, law enforcement, fire protection, and rescue-medical resource allocation models must be run using the appropriate model. The easiest means of using the models is with a local computer where repeated runs may be made to develop resource allocation reports.

The philosophy used in the development of this Guide and allocation models is based upon the following assumptions:

- (a) The demand for public safety services is directly related to an area's population size.
- (b) A reliance upon local knowledge concerning the population's attitudes or inclinations, coupled with the history of public safety incidents, is essential.

- (c) A public safety agency can adequately translate personnel requirements into operational unit (e.g., engine company) make-up and assignment, given an indication of the expected demand upon resources and the estimated number of personnel required.
- (d) The level of protection ordinarily provided in an area is the standard to which the allocation model will adhere.
- (e) Regardless of public safety resource-to-population ratios, the resources for any given community are being 100 per cent utilized.
- (f) The risk area population is willing to be relocated.
- (g) Host area residents understand the gravity of the relocation situation and will allow the risk area population to settle into host area homes and other facilities.
- (h) The criminal justice system (law enforcement, city and county attorneys, public defenders, judiciary, probation and parole personnel, etc.) will have pre-planned and coordinated their activities to provide reasonable service.
- (i) Private security and alarm companies will continue to maintain service contract obligations in risk and host areas.
- (j) Private and public maintenance services normally employed for public safety facilities and equipment (vehicles, communications equipment, and other special equipment) will continue to be provided.

- (k) The actions of all persons involved in crisis relocation operations will be more predictable when these individuals are assured that there will be adequate relocation facilities and that their homes and possessions in the risk area will be adequately protected.

Reports produced using the allocation models are estimates of required personnel based upon a combination of historical and projected situational information. One must bear in mind that the estimates are the best available at the time and with a given set of input data. Plans are just that, PLANS! They express future views of things to be accomplished under a given set of circumstances. If the circumstances are significantly changed, then so must there be changes to the planned actions.

Thus, the major problems in allocating public safety resources during the crisis relocation operation can be primarily attributable to the myriad unforeseeable circumstances that may occur. Will weather conditions allow timely relocation? Will there be sufficient advance notice? Has an adequate state of readiness been achieved? Will people cooperate? The resource allocation models included in this Guide are based upon a philosophy which fully appreciates the need for flexibility in planning.

Heavy reliance is placed upon local conditions, experience, and policy as the bases for public safety performance. Several factors (K1, K2, etc.) are included in each model, permitting customization of allocation reports. Consider the following factors which are used by the models to modify historical experience.

K1 - Personnel Crisis Factor

There is a possibility that all persons assigned to the risk area will not remain on duty. This

factor provides a convenient means for adjusting the estimate of required personnel by taking an estimated desertion percentage into account.

K2 - Crisis Incident Factor

This factor provides a means for adjusting the historical incident levels, either up or down from normal levels, to account for expected incident level changes due purely to the crisis.

W - Workload Factor

Depending upon departmental policy and resulting planning, the workload may increase or decrease. This factor provides a means to input the expected results of workload planning to the allocation model results.

The two terms, "24-hour coverage positions" and "less than 24-hour coverage positions," refer to the basic daily staffing requirements of every public safety organization. Specifically, a 24-hour coverage position is one which is staffed continuously throughout the 24 hours in a day. Staffing may be accomplished using any work schedule which meets the requirement; for example, one 24-hour shift, three 8-hour shifts, etc. The work schedule used to meet the requirement is unimportant. A less than 24-hour coverage position is one which does not require continuous 24-hour coverage, and is usually staffed on an 8-hour per day work schedule.

Methodology

The three allocation models share a basic methodology which is based upon performance of the three steps depicted in Figure 2.

* The time periods begin at the time indicated. For example, $t=24$ hours is the beginning of the second day, not the end.

Time Period*	Description
$t=-9$ hours	At $t=-9$ hours or earlier, local officials first receive notice to activate their crisis relocation plans. The general population will be notified subsequently at a time designated by the relocation notification. That time period has been designated for allocation purposes as $t=0$ hours. Plans are that at least 9 hours will be available for activation of public safety machinery before the general notice is issued.
$t=0$ hours	The general population will be notified to begin relocation at this time. The 0 hour denotes the beginning of the first day of population relocation. All public safety provisions should be available and operating by this time. Included would be the transfer of all families of public safety personnel to Host areas. In addition, it is expected that perhaps 12% of the general population may have spontaneously relocated.
$t=24$ hours	This time period represents the beginning of the second day following issuance of the general notice to relocate. A considerable portion of the population will have relocated by this time, as well as the initial movement of excess public safety resources.
$t=48$ hours	At the beginning of the third day of relocation, a majority of the transferable population and excess public safety resources should have been transferred.
$t=72$ hours	At the beginning of the fourth day of relocation, the transferable population should have been relocated.
$t=n$ hours	This time period is non-specific and has been included in case more time is required to carry out the relocation process. In actual use, the appropriate time period should be substituted, for example: $t=84$ hours, $t=96$ hours, etc.

Table 1. RELOCATION PHASE TIME LINE ACTIVITY

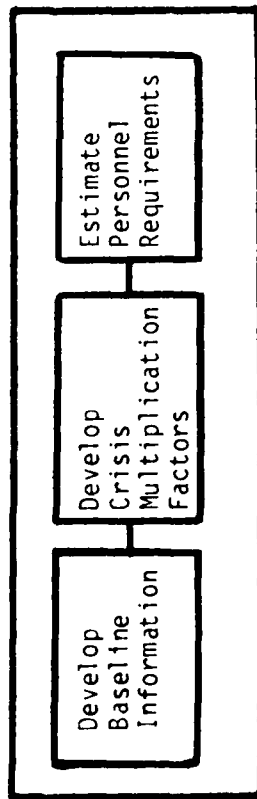


Figure 2. Allocation Method

Each allocation report is prepared using a set of time periods determined by the user. The time periods may be any chosen; the corresponding input data should be based upon these periods. Generally, the first time period is one which precedes actual evacuation of population at time $t=0$ by up to, say, 24 hours. The time periods following $t=0$ are those required to relocate the population.

Table 1 describes the activity associated with the various time periods of a typical relocation schedule. Notice that the periods range from $t=-9$ (nine hours before actual movement of the population) through $t=n$ hours (any number of hours chosen).

Application Example

Specific parts of this Guide are concerned with resource allocation problems of law enforcement, fire protection, and rescue-medical services. Each part contains data forms, computer program listings, allocation procedures, and explanations sufficient for preparation of corresponding resource allocation reports. This application example is designed to assist you in understanding the overall resource allocation process, and will serve as a resource to which you may refer.

The main thrust of this example is to: a) develop input data, b) convert this data for computer input,

c) run the program, and d) interpret the allocation report produced by the computer run. A complete set of manual calculations has been included to assist you in visualizing the process.

Development of Input Data

The development of public safety resource allocation input data begins with the collection and assembly of general information about an area, and with a knowledge of the community-level crisis relocation plan on operation. Tables 2 and 3 contain area information on the mythical community of Anywhere, Anystate (AS), the risk area used in this application example.

Specifically, Table 2 is a listing of typical general risk area data for Anywhere, Anystate. The data applies only to fire protection; additional data would be required for law enforcement and rescue-medical resources.

Table 3 is a typical operations plan which contains fundamental planning decisions required in crisis relocation planning; that is, decisions concerning community-level command organization, personnel policy, service delivery policies, etc. The input data contained in Figure 3 is built upon the general information contained in Tables 2 and 3.

Figure 3 illustrates the input data forms required by each of the three resource allocation models. The example form and data illustrated are for fire protection, but the data elements are typical of those required by each of the three models (only the element titles change). A description of each input data element is included in subsequent pages. When allocation reports are to be prepared using a computer program, the data must be re-formatted for keypunching or data entry. (See subsequent sections for data re-formatting instructions.)

<u>Area Name:</u>	Anywhere, Anystate (AS)
<u>Area Type:</u>	Risk
<u>Area Include:</u>	(a) Community 1 (b) Community 2
<u>Area Population:</u>	(a) Community 1 = 75,320 (b) Community 2 = 89,000 TOTAL 164,320
<u>Relocation Routes:</u>	(a) North (3 staging areas) (b) South (2 staging areas) (c) East (1 staging area)
<u>Staging Areas:</u>	(a) 3 supported in the Risk area (b) 6 supported on the relocation routes
<u>Personnel:</u>	(a) Community 1 - 81 uniformed 16 civilian 97 TOTAL (b) Community 2 - 99 uniformed 18 civilian 117 TOTAL
<u>Average Annual Fire Incidents:</u>	Structure 981.6 Transportation 402.7 Grass and Brush 528.6 Rubbish 276.9 Other 327.2 TOTAL 2517.0

Table 2. TYPICAL GENERAL RISK AREA INFORMATION

If while developing the information called for in Figure 3 (Sheet 2) you find a conflict between the "Position Classifications" in Column 1 and your particular organizational make-up, you may cross out any classification, re-name the classification, or move the classification to a desired location. Remember, however, that the computer program will print out information using the pre-programmed column headings. If you change a work classification, you will need to manually mark the correct heading in the allocation report after it has been prepared by the computer. The same action applies to manually-generated reports, but the column headings may be changed on the report form before entering the calculations and the new work classifications may be substituted in the manual instructions.

Ideally, the public safety resource allocation reports will be generated by community public safety departments as a part of CR planning efforts. In some cases, the crisis relocation planning may be accomplished by the local emergency preparedness agency, with the departments providing plans review and advisory functions only.

Public safety questionnaire forms are provided in subsequent sections of this Guide to assist in the collection of departmental data. An example of the fire protection questionnaire (and data) is illustrated in Figure 4.

Description of Allocation Report

The report illustrated in Figure 5 is typical of a resource allocation model output report that can be produced using the allocation model. The report format illustrated is one that would result from using manual fire protection allocation data processing procedures.

The example report is based upon fire input data typical of a risk area with approximately 160,000 population. Although the report is on fire protection, the format is similar to law enforcement and rescue-medical report types. Each type varies according to personnel functions (Columns 30-220) and incident types (Columns 290-340); that is, the column headings and specific column numbers will be different for each report type to account for the different functions and incident types particular to each public safety service. General information comprising the report includes the following:

- (a) report title
- (b) community and state
- (c) area type
- (d) line number
- (e) time period
- (f) population
- (g) personnel (by work classification)
- (h) incident type.

Included also is a summary of personnel data by work classification; that is, personnel assigned to the various work classifications requiring 24-hour coverage and those requiring less than 24-hour coverage--all distributed by time phase and specific function (for example, fire suppression, administration, etc.). Estimates of public safety incidents by incident type, and, in total, are included in the output report by time period. In addition, the following estimates of personnel availability and requirement are included by time period.

- available 24-hour personnel per shift
- required 24-hour personnel per shift, based upon changes in the area's normal population
- required 24-hour personnel per shift, based upon departmental policy

1. Public safety resources within the defined area will be under a unified area command. Each participating agency will be represented in the command structure.
2. Upon receipt of notice from the Governor's Office, implementation of the relocation plan will begin.
3. Highlights of the plan include the following items:
 - (a) Establish command structure and communication links as planned.
 - (b) Recall personnel, initiate 12-hour shifts, and relocate public safety families as planned.
 - (c) Make assignments of resources to critical installations and staging areas as planned.
 - (d) Restructure the public safety service levels as planned.
 - (e) Issue a general notice to the public to begin relocation at t=0 hours. (It is expected that t=0 will occur no sooner than 9 hours following receipt of the Governor's relocation order.)
4. Population is expected to be transferred out of the area according to the following schedule:

<p>T=9 hrs. to T=0 hrs.</p> <p>T=0 hrs. to T=24 hrs.</p> <p>T=24 hrs. to T=48 hrs.</p>	<p>spontaneous relocation of approximately 10% of normal population (16,000). Remaining population, 144,320.</p> <p>planned transfer of approximately 43% of the normal population (70,000). Remaining population, 74,320.</p> <p>planned transfer of approximately 35% of the normal population (58,000). Remaining population, 16,320; or approximately 10% of normal.</p>
----------------------------------------------------------------------------------------	------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Table 3. TYPICAL RISK AREA OPERATIONS PLAN

- personnel surplus or shortage per shift, based upon changes in the area's normal population
- personnel surplus or shortage per shift, based upon departmental policy
- requirement for 24-hour personnel and less than 24-hour personnel per day, based upon changes in the area's normal population
- requirement for 24-hour personnel and less than 24-hour personnel per day, based upon departmental policy on minimum manning.

Understanding the Allocation Report

Each allocation report is for only one of the three public safety services and for only one risk or host area; therefore, a minimum of three reports, one for each service, is required to allocate public safety resources in a given risk or host area.

Referring to Figure 5, note that the report is for "fire" and that there are three pages to the report. This report was prepared for a mythical location called "Anywhere, Anystate" or (AS). Also note that the example is for a risk area. Along the bottom of each page, column numbers (10, 20, 30 ... etc.) have been included for reference purposes. In addition, the report lines are numbered (1, 2, 3 etc.).

The information of primary interest has been included in Report Columns 290-410. This calculated information includes:

<u>Information Type</u>	<u>Reference Column*</u>
(a) Incident frequency	290 to 340
(b) Available 24-hour personnel	350
(c) Required 24-hour personnel	360 and 370
(d) Surplus or shortage of 24-hour personnel	380 and 390
(e) Total personnel required	400 and 410

Note that in Column 340, the total fire incidence is 6.9 per day or 2,518 incidents per year at the beginning of time period t=-9. At t=0, it can be seen that a change in population of 20,000 was planned between the onset of crisis relocation at t=-9 hours to t=0 hours; thus, the normal population of 164,320 was expected to reduce to 144,320. The effect of this population change on the expected incidence rate for total fires per day would be a decrease from 6.9 to 6.4. This decrease has been estimated to continue until t=48 hours, when the population in the area; the 16,320 critical workers remaining in the area; the expected fire incidence is 2.6 per day. Note the nonlinear decrease; that is, when only 10% of the original population is present, the expected fires are

 * The column numbers will be different in law enforcement and rescue-medical reports, but the same information is provided in each report type.

FIRE INPUT DATA

(Sheet 1)

1. Community Name Any where, State AS 2. Area Type Risk
3. Personnel Position Summary (See Sheet 2)
- 4., 5., 6., 7., and 8. See chart below:

4. Reloca- tion Time Periods	5. Population by Time Period	6. Work Shifts	7. Min. 24-Hr. Personnel/Shift Dept. Policy	8. Workload Factor
normal	164,320	//////	//////	//////
t= -9	164,320	2-3	73	.7
t= 0	144,320	2-2	60	.7
t= 24	74,320	2-2	50	.7
t= 48	16,320	2-2	34	.7
t=				

9. Incident Type	Incident Frequency (per year)
structure	981.6
transportation	402.7
grass & brush	528.6
rubbish	276.9
other	329.2
TOTAL INCIDENTS	2517.0

10. Human Contribution to Incidents
by Incident Type 0
11. Personnel Crisis Factor (k_1) 1.1
12. Incident Crisis Factor (k_2) 1.0
13. Twenty-four Hour Coverage
Personnel Assigned Per Day 67

approximately 27% of the original figure at t=-9. The reason for this higher figure lies in the fact that although 90% of the population is expected to leave the site, all of the structures will, of course, remain. In the community of Anywhere, people are assumed to be directly responsible for at least 70% of all fires.* Therefore, the final incident figure represents the effect of only 16,320 persons. The estimated incidence of specific fire types (Columns 290-330) is obtained by multiplying the estimated fire totals by the appropriate ratio for each fire incident type.

Available 24-hour coverage personnel per shift are contained in Column 350. These figures are based upon the current personnel roster and the application of workload reduction techniques which enhance the availability of personnel. Reflected in the t=-9 line is the availability of 108 24-hour coverage personnel, resulting from the jurisdiction's decision to assume a two-shift work schedule at the onset of the emergency and to make other changes which increased the available 24-hour coverage personnel from the original 67 per shift to 108 per shift. Subsequent report lines reflect a variable increase in the number of available personnel depending upon requirements in each time period.

In Columns 360 and 370, two estimates of 24-hour coverage personnel are provided. The Column 360 estimate was made on the basis of:

- population at a given time
- historical incident rates
- historical evidence of fires caused by people

- number of persons required only because of the crisis
- actions that can be taken to reduce workload
- the impact of the crisis upon the historical incident rates.

Column 370, on the other hand, is an estimate of 24-hour coverage requirement, based upon departmental policy.

Columns 380 and 390 contain estimates of the per shift surplus or shortage of 24-hour personnel. The figures are obtained (respectively) by subtracting a figure in Column 360 or 370 from the figure in Column 350; that is, subtract the estimated 24-hour personnel requirement from the supply of 24-hour personnel.

Columns 400 and 410 contain estimates of required 24-hour coverage and less than 24-hour coverage personnel combined. Column 400 figures are based upon the addition of less than 24-hour personnel (Column 270) to the calculated estimate of 24-hour personnel per shift (Column 360) adjusted to per day values. Column 410 combines the less than 24-hour personnel per shift figure (Column 270) with the estimate of 24-hour personnel based upon departmental policy (Column 370) adjusted to per day values.

In the illustration, it can be seen that based upon calculated personnel estimates (Column 380) for time period t=-9, 97 (48.5 x 2 shifts) would be available for transfer to host areas to protect relocated citizens. In subsequent time periods, additional personnel are the basis of a resources transfer schedule. There will be 12 additional personnel available per day for transfer at the beginning of time period t=0 [(54.5 x 2) - (48.5 x 2) = 12].

*Based on the National average

DEPARTMENT POSITION CLASSIFICATION	CURRENT DEPARTMENT PERSONNEL ASSIGNMENT	REASSIGNMENT OF DEPARTMENT PERSONNEL						ASSIGNMENT OF NON-DEPARTMENT PERSONNEL						PERSONNEL BY ALLOCATION TIME PERIOD AFTER ADJUSTMENT *					
		RELOCATION TIME PERIODS						RELOCATION TIME PERIODS						RELOCATION TIME PERIODS					
		t=-9	t=0	t=24	t=48	t=72	t=N	t=-9	t=0	t=24	t=48	t=72	t=N	t=-9	t=0	t=24	t=48	t=72	t=N
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
<u>24-HOUR COVERAGE POSITIONS</u>																			
ROUTINE FUNCTIONS:																			
Suppressor	182	-7	-10	-5	+6	-	-	0	0	0	0	-	-	175	172	177	188	-	-
Communications	12	0	0	0	-6	-	-	0	0	0	0	-	-	12	12	12	6	-	-
Logistics	5	0	0	-2	-2	-	-	0	0	0	0	-	-	5	5	3	3	-	-
Arson Investigation	2	0	-2	-2	-2	-	-	0	0	0	0	-	-	2	0	0	0	-	-
Public Informator	1	+1	+1	+1	+1	-	-	+2	+2	+2	+2	-	-	4	4	4	4	-	-
RELOCATION FUNCTIONS:																			
Fire Patrol	0	0	+3	+3	+4	-	-	0	+6	+6	+8	-	-	0	9	9	12	-	-
Staging Area Support	0	+6	+6	+6	0	-	-	+6	+6	+6	0	-	-	12	12	12	0	-	-
Critical Installation Support	0	+2	+2	+2	+2	-	-	+4	+4	+4	+4	-	-	6	6	6	6	-	-
Fire Watch	0	0	0	0	0	-	-	0	0	0	0	-	-	0	0	0	0	-	-
TOTAL	202	+2	0	+3	+3	-	-	+13	+18	+18	+14	-	-	216	220	223	219	-	-

<u>LESS THAN 24-HOUR POSITIONS</u>																			
ROUTINE FUNCTIONS:																			
Training	2	-2	-2	-2	-2	-	-	0	0	0	0	-	-	0	0	0	0	-	-
Prevention	4	0	+2	+2	+2	-	-	0	0	0	0	-	-	4	6	6	6	-	-
Administration	6	0	0	-3	-3	-	-	0	0	0	0	-	-	6	6	3	3	-	-
RELOCATIONS FUNCTIONS:																			
TOTAL	12	-2	0	-3	-3	-	-	0	0	0	0	-	-	10	12	9	9	-	-

*Total personnel figures for time periods are obtained by combining the numbers in columns according to the summation indicated above Columns 15 thru 20

Figure 3. TYPICAL INPUT DATA (Sheet 2 of 2)

FIRE PROTECTION RESOURCE ALLOCATION MODEL MANUAL DATA PROCESSING INSTRUCTIONS

These instructions may be used, together with the following forms, to collect and prepare Fire Protection Resource Allocation Reports suitable for Crisis Relocation Planning (CRP).

- 1) Figure 5 - Fire Protection Resource Allocation Report Form (Sheets 1, 2, and 3)

- 2) Figure 3 - Fire Input Data (Sheets 1 and 2)

Note: Complete the input data form, Figure 3, before beginning the steps of this manual procedure.

STEP

INSTRUCTION

1. LOCATION

Write the name of your community and state on Page 1 of Figure 5.

RESPONSE: Self-explanatory

2. AREA TYPE:

Write the area type of your community (Risk or Host) on Page 1 of Figure 5.

RESPONSE: Self-explanatory

3. TIME PERIODS AND POPULATION (t=-9 to t=n)

- (A) Look up the crisis relocation time periods contained in Data Element 4 of Figure 3 and write them on Page 1, Figure 5, Column 10. Put the earliest time in Line 1, followed by subsequent times in ascending time order (e.g., line 1 = time 1, line 2 = time 2, etc.).

- (B) Look up the crisis relocation populations for the various time periods in Data Element 5 of Figure 3 and write them on Page 1, Figure 5, Column 20, next to the appropriate time periods.

RESPONSE: Remember that time periods are relative. For example, you may have chosen -24 hours as your starting time instead of the -9 shown in Figure 3, Sheet 2. Nevertheless, there should be several time periods starting with some period before t=0 (when people are scheduled to start relocating) and extending for one or more days following that initial population movement time period.

4. PERSONNEL (t=-9 to t=n)

Obtain the 24-hour coverage and less than 24-hour coverage personnel counts from Data Element 3 (Columns 15 to 20) of Figure 3, Sheet 2, for each period, and write the values into Figure 5, Columns 30 through 270, as appropriate. Personnel figures should be placed on Lines 1 to 7 according to corresponding time periods.

RESPONSE: Self-explanatory

FIRE PROTECTION QUESTIONNAIRE

164,320

1. What is the jurisdiction's population?

2. Indicate the number of uniformed and non-uniformed personnel in the categories listed below:

24-Hour Coverage Positions

	Uniformed	Non-Uniformed
Suppression	182	-
Communications	3	9
Arson Investigation	2	-
Public Information	1	-
Logistics (Supply)	1	4
Other	-	-
Total	189	13

Less Than 24-Hour Coverage Positions

Administration	4	2
Prevention	3	1
Training	2	-
Other	-	-
Total	9	3

3. What is the total number of uniformed personnel (fire fighters) normally available for assignment per day (a 24-hour period)?

67

4. Are your 24-hour coverage positions normally staffed using primarily:

2-hour shifts
12-hour shifts
24-hour shifts

☒ 24-hour shifts

(Please mark the most appropriate shift arrangements only.)

5. Indicate your incident response history for a one- (1) year period. If less than a year's history is available, estimate the data. If you can't break down your response by incident type, fill in those you can or just enter the total.

Structure Fire	987.6
Transportation Fire	422.7
Grass or Brush Fire	528.6
Public Fire	276.9
Other	329.2
Subtotal	2517.0
Rescue Medical	-
Total	-

Not Applicable

NOTE: In these next several steps, the procedure must be carefully followed to eliminate error - you can see this by carefully studying the titles of Steps 5 and 6; that is, there are calculations for different time periods.

5. FIRE INCIDENTS PER DAY (t=-9)

(A) Total Fire Incidents Per Day

Obtain the total fire incidents per year from Data Element 9, Figure 3, and divide by 365 (days in a year). Place the results in Figure 5, Line 1, Column 340.

If no total incidents value is available from Data Element 5, Figure 3, you may estimate the total incidents by multiplying the normal population (Data Element 5) by .016 (the national average of fires per person per year) and divide by 365 (days in a year).

e.g., estimate of total incidents =

$$\frac{(\text{normal population})(.016)}{365}$$

RESPONSE: for time t=-9

$$\frac{2517}{365} = 6.89 \text{ or } 6.9 \text{ total incidents per day}$$

(B) Specific Incident Type Rates Per Day (t=-9)

Obtain the incident values for the specific incident types from Data Element 9, Figure 3, and write them on Figure 5, Sheet 3, Line 1, Columns 290 through 330.

If no specific incident values are available, you may estimate the values using information in Table 4 and the following procedures.

TABLE 4
SPECIFIC FIRE INCIDENT TYPES
AND CORRESPONDING DATA

Incident Type	Output Report	
	Column	Incident Type Factor
Structure	290	.38
Transportation	300	.15
Grass and Brush	310	.24
Rubbish	320	.11
Other	330	.12

In Table 4, each incident type is associated with a column number and a decimal. For example, the incident type "structure," the Column Number 290, and the decimal .38, are all associated with one another. The decimal indicates that 38% of all calls for fire protection services are generally for structure fires. The column number designates where the estimated incident rate for the corresponding incident type is to be placed on Figure 5, the allocation report form.

Use the following procedure to estimate value for time (t=-9) (or your earliest crisis relocation time period).

- (1) Structure - Multiply the total fire incidents determined in 5A above by the "Incident Type Factor" of .38 (from Table 4). Place the calculated value on Figure 5, Page 3, Line 1, Column 290.

LOCATION: **ANYWHERE, AS** PROTECTED AREA TYPE: **RISK** PAGE 1
 ** PERSONNEL

** 24 HOUR COVERAGE
 ** ROUTINE FUNCTIONS ** CRISIS FUNCTIONS **

LINE	TIME	POPULATION	SUPPR	COMMU	LOGIST	ARSON	PUBLIC INFO		FIRE PATROL	FIRE WATCH	STAGE AREAS	CRITICAL INSTAL	TOTAL 24 HR PER
1	t=9	164,320	175	13	5	2	4		0	0	12	6	316
2													
3													
4	t=0	144,320	172	12	5	0	4		9	0	12	6	220
5													
6	t=20	74,320	177	12	3	0	4		9	0	12	6	223
7													
8	t=48	16,320	188	6	3	0	4		12	0	0	6	219
9													
10													
11													
12													
13													
14													
	10	20	30	40	50	60	70	80	90	100	110	120	140

COLUMN NUMBERS

Figure 5. TYPICAL FIRE PROTECTION RESOURCE ALLOCATION REPORT
 PRODUCED MANUALLY (Page 1 of 3)

(2) Repeat 1, substituting the next incident type in order and corresponding information (incident type factor and column number), until the daily incident rate for each incident type for time t=-9 is complete. Put the results on Figure 5, Page 3, Line 1, Columns 300 to 330.

RESPONSE:

Time Period	Incident Type	Type Factor	Total Inc.	Type Rate	Column
t=-9	structure	.38	X 6.9	= 2.9	290
t=-9	transp.	.15	X 6.9	= 1.0	300
t=-9	grass/brush	.24	X 6.9	= 1.7	310
t=-9	rubbish	.11	X 6.9	= .8	320
t=-9	other	.12	X 6.9	= .8	330

NOTE: Steps 5A and 5B resulted in the completion of incident values for time t=-9. The following steps, 6A, 6B, and 6C, will calculate the incident values estimated for the remaining time periods.

6. Estimated Fire Incidents Per Day (t=0 to t=n)

(A) Estimate of Total Fire Incidents (t=0)

Estimate the total number of fire incidents per day for time period t=0 using the following formula: (Place the resulting value in Figure 5, Page 3, Line 2, Column 340).

Estimated total fire incidents per day =

$$\lambda 1(P) + \lambda 2 \left(\frac{P_{t=[-n...n]}}{365} \right) (K_2)$$

where: λ = the expected incident rate per person per year.

$$\lambda = \frac{\text{total incidents per year}}{\text{normal population (P)}}$$

Obtain the total incidents per year from Data Element 9, Figure 3, and the normal population from Data Element 5.

If the total incidents figure is not provided, then estimate the total incidents per year by multiplying the normal population (P) by .016 (National Average).

$\lambda 1$ = that portion of λ not attributable to the presence of the population (power distribution, equipment, spontaneous combustion, etc.).

$\lambda 1 = \lambda (1 - \% \text{ of fires due to humans})$

(a) = Obtain the value for λ using the formula above.

(b) = Obtain the % of fires due to humans from Data Element 10, Figure 3, or use the National Statistic of 70% (.7) if the percentage is not provided.

PERSONNEL

LESS THAN 24 HOUR COVERAGE

** ROUTINE FUNCTIONS ** ** CRISIS FUNCTIONS **

LINE	TRAIN	PREVENT	ADMIN															TOTAL < 24 HR PER
1																		
2	0	4	6															10
3																		
4	0	6	6															13
5																		
6	0	6	3															9
7																		
8	0	6	3															9
9																		
10																		
11																		
12																		
13																		
14																		
	150	160	170	180	190	200	210	220	230	240	250	260	270	280				

COLUMN NUMBERS

Figure 5. TYPICAL FIRE PROTECTION RESOURCE ALLOCATION REPORT
PRODUCED MANUALLY (Page 2 of 3)

λ_2 = that portion of λ attributable to the presence of the population.

$$\lambda_2 = \lambda - \lambda_1$$

P = the community's normal population obtained from Data Element 5, Figure 3.

$P_t = (-n \dots n)$ = population of the community at a specific time period; for example, $t=-9$, $t=0$, etc. Obtain population from Data Element 5, Figure 3.

K_2 = the incident crisis factor. This factor is a convenient means to increase or decrease the λ to account for anticipated changes in the normal fire incident rates. Obtain the factor (K_2) from Data Element 12, Figure 3.

365 = this factor is used to convert the yearly incident rate to a daily rate.

RESPONSE: Total incidents at $t=0$ =

$$\left[\frac{\lambda_1 (P) + \lambda_2 (P_{t=0})}{365} \right] (K_2)$$

where:

$$\lambda = \frac{2517}{164,320} = .0513$$

$$\begin{aligned} \lambda_1 &= .01534 (1-.7) \\ &= .01534 (.3) \\ &= .004602 \end{aligned}$$

$$\begin{aligned} \lambda_2 &= .01534 - .004602 \\ &= .01083 \end{aligned}$$

$$P = 164,320$$

$P_t = 0 = 144,320$ (10% of population had spontaneously relocated)

$$K_2 = 1.0$$

then:

Total incidents at $t=0$ =

$$\left[\frac{.004602 (164,320) + .01083 (144,320)}{365} \right] (1.0)$$

$$= \frac{756 + 1563}{365} (1.0)$$

$$= \frac{2318}{365} (1.0)$$

$$= 6.4$$

(B) Estimate of Total Fire Incidents ($t=24$ to $t=n$)

Repeat 6(A) above for time periods $t=24$ through $t=n$ (or whatever time periods you have used) and place the results in corresponding Lines 3, 4, 5, and 6, Column 340, Figure 5, as appropriate.

INCIDENTS PER DAY **

UNIT	STRUCT	TRANS	GRASS & BRUSH	RUBBISH	OTHER	TOTAL FIRES	AVAIL 24 HOUR PER/SHT	EST REQ 24 HR PER SHIFT BASE POP	MIN 24 HR PER SHIFT DEP POL	SUR/SHT 24 HR PER SHIFT BASE POP	SUR/SHT 24 HR PER SHIFT DEP POL	TOT PERS PER/DAY BASE POP	TOT PERS PER/DAY DEP POL
1	2.6	1.0	1.7	.8	.8	6.9	108	59.9	72	48.1	36	129	154
2	2.4	.9	1.5	.7	.7	6.4	110	56.3	60	53.7	50	124.6	132
3	1.5	.6	.9	.4	.5	4.3	111.5	42.5	50	69	61.5	94	109
4	.7	.3	.5	.2	.2	2.4	109.5	27.6	34	81.9	75.5	64.2	77
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													
	790	300	310	320	330	340	350	360	370	380	390	400	410

COLUMN NUMBERS

Figure 5. TYPICAL FIRE PROTECTION RESOURCE ALLOCATION REPORT
PRODUCED MANUALLY (Page 3 of 3)

RESPONSE: Total incidents at $t=24$ =

$$\left[\frac{\lambda 1 (P) + \lambda 2 (P_t = 24)}{365} \right] (K_2)$$

where all factors are the same as for Step 6A except:

$$P_t = 24 = 74,320$$

then:

Total incidents at $t=24$ =

$$\left[\frac{.004602(164,320) + .01083(74,320)}{365} \right] (1.0)$$

$$= \left[\frac{756 + 803}{365} \right] (1.0)$$

$$= 4.3$$

Total incidents at $t=48$ =

$$\left[\frac{\lambda 1 (P) + \lambda 2 (P_t = [48])}{365} \right] (K_2)$$

where all factors are the same as for Step 6A except:

$$P_t = 48 = 16,320$$

then:

Total Incidents at $t=48$ =

$$\left[\frac{.004602(164,320) + .01083(16,320)}{365} \right] (1.0)$$

$$= \left[\frac{756 + 177}{365} \right] (1.0)$$

$$= 2.6$$

(C) Estimates of Incident Rates for Specific Types ($t=0$ to $t=n$)

Use the following procedure to prepare the estimates of specific incident rates for time periods $t=0$ through $t-n$.

1. Multiply the estimated total number of incidents determined in 6A for time period $t=0$ by the ratio of structure incidents (see Table 4 - e.g., 38) to the total fire incidents provided in Data Element 9, Figure 3. Place the resulting value on Figure 5, Page 3, Line 4, Column 290.
2. Repeat 1, substituting the next incident type and corresponding information (incident type factor and column number), until the daily incident rate for each incident type, for time periods $t-24$ through $t-n$ has been obtained. Put the results on Figure 5, Page 3, Lines 3, 4, 5, and 6, Columns 290-330, as appropriate.

RESPONSE:

Time Period	Incident Type	Type Factor	Total Incidents	Type Rate	Column
t=0	structure	.38	x	6.2	2.4
t=0	trans.	.15	x	6.2	.9
t=0	grass/brush	.24	x	6.2	1.5
t=0	rubbish	.11	x	6.2	.7
t=0	other	.12	x	6.2	.7
t=24	structure	.38	x	3.9	1.5
t=24	trans.	.15	x	3.9	.6
t=24	grass/brush	.24	x	3.9	.9
t=24	rubbish	.11	x	3.9	.4
t=24	other	.12	x	3.9	.5
t=48	structure	.38	x	1.9	.7
t=48	trans.	.15	x	1.9	.3
t=48	grass/brush	.24	x	1.9	.5
t=48	rubbish	.11	x	1.9	.2
t=48	other	.12	x	1.9	.2

7. Available 24-Hour Personnel Per Shift (t=-9 to t=n)

(A) Available Personnel (t=-9)

Divide the total of 24-hour coverage personnel for time period t=-9 from Data Element, Figure 3, Sheet 2, by the number of work shifts indicated in Data Element 6 to obtain the available personnel per shift. Put the resulting value on Figure 5, Page 3, Line 1, Column 350.

Note: Carry the decimal out to 2 places (e.g., xx.xxx)

RESPONSE:

216 = 108 (use first number of shift code)
2

(B) Available Personnel (t=0 to t=n)

Repeat 7(A) above for time periods t=0 through t=n and insert the resulting values on Figure 5, Page 3, Lines 2, 3, 4, 5, and 6, Column 350.

RESPONSE:

t = 0 220 = 110
2

t = 24 223 = 111.5
2

t = 48 219 = 109.5
2

8. Estimate of required 24-hour personnel per shift based upon population (t=-9 to t=n)

(A) Estimate of Required Personnel (t=-9)

Estimate the required 24-hour personnel per day for period t=-9 using the following formula: (place the resulting value on Figure 5, Page 3, Line 1, Column 360)

Estimate of Required 24-hour Personnel =

$$\left[\frac{\lambda 1(P) + \lambda 2(P)}{S} \right]_{t = [-n \dots n]}^{(M)} \left(W_{t = (-n \dots n)} \right)$$

$$(K_1)(K_2) + C_t = (-n \dots n)$$

where: λ = the expected fire incident rate per person per year

$$\lambda = \frac{\text{total incidents per year}}{\text{normal population (P)}}$$

Obtain the total incidents per year from Fire Input Data Element 9, Figure 3, and the normal population from input Element 5, Figure 3.

If the total incidents figure is not provided, then estimate the total incidents per year by multiplying the normal population (P) by .016 (National Average).

$\lambda 1$ = that portion of λ not attributable to the presence of the population (power distribution, equipment, spontaneous combustion, etc.)

$\lambda 1$ = λ (1-% of fires due to humans)

(a) = Obtain the value for λ using the formula above

(b) = Obtain the % of fires due to humans from Data Element 10, Figure 3, or use the National Statistic of 70% (.7).

$\lambda 2$ = that portion of λ attributable to the presence of the population.

$$\lambda 2 = \lambda - \lambda 1$$

P = the community's normal population obtained from Data Element 5, Figure 3.

$P_t = (n \dots n)$ = population of the community at a specific time period; for example, $t=-9$, $t=0$, etc.

M = the staffing factor established within the community.

$$M = \frac{\text{pre-crisis 24-hr. cov. pers. assigned/day}}{\text{total pre-crisis incidents per day}}$$

Obtain the 24-hour coverage personnel per day from Data Element 13, Figure 3.

Obtain the total fire incidents per year from Data Element 9, and divide by 365 to convert to incidents per day.

Note: Carry this factor out to 3 places (e.g., x.xxx).

If the total of incidents is not provided, then estimate the incidents per year by multiplying the normal population (P) by .016 (National Average).

K_1 = the personnel crisis factor. The factor is a convenient means of adjusting for possible deserters. Obtain the factor from Fire Data Element 11, Figure 3.

K_2 = the crisis factor. This factor provides a convenient way to adjust for increases or decreases to the fire incident rate (λ) should adjustment become necessary. Obtain the crisis factor from Data Element 12, Figure 3.

$W_t = (-n \dots n)$ = workload reduction factor at time (n). The workload factor provides a convenient way of adjusting the equation for increases or decreases in workload by time period. Obtain the factor from Data Element 8, Figure 3, for the time period of interest.

S = shift factor. The shift factor scales the estimate of required 24-hour coverage positions to the appropriate work shift period; for example, 8 hours or 12 hours. Obtain the work shift code from Fire Data Element 6, Figure 3. The S-factor corresponding to the code may be found below:

Work Shift Code	S-Factor
3/3	365
2/2	365
2/1	730
3/1	1095

$C_t = (-n \dots n)$ = crisis personnel (C) are those persons performing functions which are applicable only to the crisis relocation operation. The crisis positions are 24-hour positions.

Obtain the C from Data Element 3, Figure 3, by subtracting the total of "Current Assignment" 24-hour coverage positions from the enhanced total of 24-hour personnel for each time period and dividing by the applicable numbers, 3 or 2, to convert Cp per shift. Obtain the divisor from Data Element 6, Figure 3. Use first digit. For example, if the code 3/3 is found, divide by 3; if 2/1 is found, divide by 2, etc.

RESPONSE: Required 24-hour personnel at $t=-9$ =

$$\left[\frac{\lambda_1 (P) + 2 (P_{t=-9})}{S} \right]^{(M)} (W_{t=-9})^{(K_1)} (K_2) + C_{t=-9}$$

where:

$$\lambda = \frac{2517}{164,000} = .1053$$

$$\lambda_1 = .01534 (1-.7) = .004602$$

$$\lambda_2 = .01534 - .004602 = .01083$$

$$P = 164,000$$

$$P_{t=-9} = 164,000$$

$$M = \frac{67}{6.9} = 9.71$$

$$W_t = -9 = .7$$

$$K_1 = 1.1$$

$$K_2 = 1.0$$

$$C_{t=-9} = \frac{216 - 202}{2} = 8$$

$$S = 365$$

then:

$$\text{Required 24-hour personnel at } t=-9 = \left[\frac{.004602 (164,320) + .01083 (164,320) (9.71) (.7) (1.1) (1.0) + 8}{365} \right]$$

$$\begin{aligned}
&= \left[\frac{756 + 1780}{365} \right] (7.476) + 8 \\
&= (6.94)(7.476) + 8 \\
&= 59.9
\end{aligned}$$

(B) Estimate of Required Personnel (t=0 to t=n)

Repeat 8(A) above for time periods t=0 through t=n and insert the results on Figure 5, Page 3, Lines 2, 3, 4, 5, and 6, Column 360, as appropriate.

RESPONSE: Required 24-hour personnel at t=0 -

$$\left[\frac{\lambda 1 (P) + 2 (P_{t=0})}{S} \right] (M) (W_{t=0}) (K_1) (K_2) + C_{t=0}$$

where all factors remain the same as for Step 8(A) except:

$$P_{t=0} = 144,320$$

$$C_{t=0} = \frac{220 - 202}{2} = 9$$

then:

Required 24-hour personnel at t=0 =

$$\left[\frac{.004602(164,320) + .01083(144,320)}{365} \right] (9.71)(.7)(1.1)(1.0) + 9$$

$$\begin{aligned}
&= \frac{756 + 1563}{365} (7.476) + 9 \\
&= (6.35) (7.476) + 9 \\
&= 56.3
\end{aligned}$$

Required 24-hour personnel at t=24 =

$$\left[\frac{\lambda 1 (P) + \lambda 2 (P_{t=24})}{S} \right] (M) (W_{t=24}) (K_1) (K_2) + C_{t=24}$$

where all factors remain the same as for Step (A) except:

$$P_{t=24} = 74,320$$

$$C_{t=24} = \frac{223 - 202}{2} = 10.5$$

then:

Required 24-hour personnel at t=24 =

$$\begin{aligned}
&\left[\frac{.004602(164,320) + .01083(74,320)}{365} \right] (9.71)(.7)(1.1)(1.0) + 10.5 \\
&= \left[\frac{756 + 805}{365} \right] (7.476) + 10.5
\end{aligned}$$

$$\begin{aligned}
&= (4.22) (7.476) + 10.5 \\
&= 42.5
\end{aligned}$$

Required 24-hour personnel at $t=48$ =

$$\left[\frac{\lambda 1 (P) - \lambda 2 (P_{t=48})}{S} \right] (M) (W_{t=48}) (K_1)(K_2) + C_{t=48}$$

where all factors remain the same as for Step 8(A) except:

$$P_{t=48} = 16,320$$

$$C_{t=44} = \frac{219 - 202}{2} = 8.5$$

then:

Required 24-hour personnel at $t=48$ =

$$\left[\frac{.004602(164,320) + .01083(16,320)}{365} \right] (9.71)(.7)(1.1)(1.0) + 8.5$$

$$= \left[\frac{756 + 177}{365} \right] (7.476) + 8.5$$

$$= (2.56)(7.476) + 8.5$$

$$= 27.6$$

9. Minimum 24-Hour Personnel Per Shift Based Upon Departmental Policy ($t=-9$ to $t=n$)

Obtain this figure from Data Element 7, Figure 3, for time periods $t=-9$ through $t=n$. Insert the

value on Figure 5, Page 3, Lines 1, 2, 3, 4, 5, and 6, Column 370 as appropriate.

RESPONSE: Self-Explanatory.

10. Surplus or Shortage of 24-Hour Personnel Per Shift Based on Population Estimate ($t=-9$ to $t=n$)

(A) Subtract the estimated personnel requirement determined for time period $t=-9$ in 8(A) (Column 360) from the available personnel determined for the same time period in 7(A) above (Column 350). Positive results indicate a surplus of personnel, but negative results indicate a shortage. Prefix shortages with a minus (-) sign. (Place the results on Figure 5, Page 3, Line 1, Column 380.)

(B) Repeat 10(A) for time periods $t=0$ through $t=n$ and insert the results on Figure 5, Page 3, Lines 2, 3, 4, 5, and 6, Column 380, as appropriate.

RESPONSE:	$t=-9$	108	-	59.9	=	48.1
	$t=0$	110	-	56.3	=	53.7
	$t=24$	111.5	-	42.5	=	69
	$t=48$	109.5	-	27.6	=	81.9

11. Surplus or Shortage of 24-Hour Personnel Based on Departmental Policy ($t=-9$ to $t=n$)

(A) Subtract the minimum personnel requirement determined in Data Element 7, Figure 3, for time $t=-9$ from the available personnel determined for the same time period in 7(A) above (Column 350). Positive results indicate a surplus of personnel, but negative results indicate a shortage. Prefix shortages with a minus (-) sign. Place the results on Figure 5, Page 3, Line 1, Column 390.

(B) Repeat 11(A) for time periods t=0 through t=n and insert the results on Figure 5, Page 3, Lines 2, 3, 4, 5, and 6, Column 390, as appropriate.

RESPONSE: t=-9 108 - 72 = 36
 t=0 110 - 60 = 50
 t=24 111.5 - 50 = 61.5
 t=48 109.5 - 34 = 75.5

12. Total Personnel Required Per Day Based Upon Population Changes (t=-9 through t=n)

(A) Multiply the estimate of required 24-hour coverage personnel for time t=-9 in 8(A) above (Column 360) by the work shifts per day indicated for the same time in Data Element 6, Figure 3. Add the result to the total of less than 24-hour coverage personnel for time t=-9 (Data Element 3), Figure 3, (Column 270). Place the results in Line 1, Column 400.

(B) Repeat 12A for time periods t=0 through t=n and insert the results on Figure 5, Page 3, Lines 2, 3, 4, 5, and 6, Column 400, as appropriate.

RESPONSE: t=-9 59.9 X 2 + 10 = 129.8
 t=0 56.3 X 2 + 12 = 124.6
 t=24 42.5 X 2 + 9 = 94
 t=48 27.6 X 2 + 9 = 64.2

13. Total Personnel Required Per Day Based Upon Departmental Policy (t=-9 to t=n)

(A) Multiply the minimum 24-hour coverage personnel based upon departmental policy for time t=-9 in 9 above (column 370) by the work

shifts per day indicated in Data Element 6, Figure 3, for the same time period. Add the result to the total of less than 24-hour personnel for time t=-9, Data Element 3, Figure 3 (Column 270). Place the results on Figure 5, Page 3, Line 1, Column 410.

(B) Repeat 13(A) for time period t=0 through t=n and insert the results on Figure 5, Page 3, Lines 2, 3, 4, 5, and 6, Column 410, as appropriate.

RESPONSE: t=-9 72 X 2 + 10 = 154
 t=0 60 X 2 + 12 = 132
 t=24 50 X 2 + 9 = 109
 t=48 34 X 2 + 9 = 77

Computer Model

A listing for the fire protection computer program is presented in Appendix A.

APPENDIX A

FIRE PROTECTION COMPUTER PROGRAM LISTING

Listing
Test Data
Test Output

```
00001 IDENTIFICATION DIVISION.
00002 PROGRAM-ID. FIRE.
00003 DATE-WRITTEN. 9-AUG-1979.
00004 DATE-COMPILED.
00005 REMARKS. FIRE RESOURCE MODEL.
00006 ENVIRONMENT DIVISION.
00007 CONFIGURATION SECTION.
00008 SOURCE-COMPUTER. CDC-5400.
00009 INPUT-OUTPUT SECTION.
00010 FILE-CONTROL.
00011 SELECT DATA-IN ASSIGN TO INPUT.
00012 SELECT OUTPUT-1 ASSIGN TO OUTPUT.
00013 SELECT OUTPUT-2 ASSIGN TO TAPE2.
00014 SELECT OUTPUT-4 ASSIGN TO TAPE3.
00015 DATA DIVISION.
00016 FILE SECTION.
00017 FD DATA-IN
00018 RECORD CONTAINS 80 CHARACTERS,
00019 LABEL RECORDS ARE OMITTED,
00020 DATA RECORD IS IN-REC.
00021 01 IN-REC.
00022 02 FILLER PIC X(79).
00023 02 DATA-CODE PIC 9.
00024 FD OUTPUT-1
00025 RECORD CONTAINS 132 CHARACTERS,
00026 LABEL RECORDS OMITTED,
00027 DATA RECORD IS OUT-REC1.
00028 01 OUT-REC1
00029 FD OUTPUT-2
00030 RECORD CONTAINS 132 CHARACTERS,
00031 LABEL RECORDS OMITTED,
00032 DATA RECORD IS OUT-REC2.
00033 01 OUT-REC2
00034 FD OUTPUT-4
00035 RECORD CONTAINS 132 CHARACTERS,
00036 LABEL RECORDS OMITTED,
00037 DATA RECORD IS OUT-REC4.
00038 01 OUT-REC4
00039 WORKING-STORAGE SECTION.
00040 01 MOR1.
00041 02 FILLER PIC 9 VALUE 1.
00042 02 FILLER PIC X(17) VALUE SPACE.
00043 02 FILLER PIC X(12) VALUE # F I R E R P.
00044 02 FILLER PIC X(10) VALUE # E S O U R.
00045 02 FILLER PIC X(10) VALUE # C E S.
00046 02 FILLER PIC X(4) VALUE SPACE.
00047 02 FILLER PIC X(10) VALUE # A L L O C.
00048 02 FILLER PIC X(10) VALUE # A T I O N.
00049 02 FILLER PIC X(10) VALUE # M O D E.
00050 02 FILLER PIC X(10) VALUE # L.
00051 02 FILLER PIC X(10) VALUE # P O R T.
00052 02 FILLER PIC X(4) VALUE # A T E.
00053 02 MOR1-MM PIC 99 VALUE ZERO.
00054 02 FILLER PIC X VALUE #/.
00055 02 MOR1-OY PIC 99 VALUE ZERO.
00056 02 FILLER PIC X VALUE #/.
00057 02 MOR1-YR PIC 99 VALUE ZERO.
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00058 02 FILLER PIC XX VALUE SPACE.
00059 02 FILLER PIC X(1) VALUE SPACE.
00060 02 PAGE-CNT PIC ZZ.
00061 01 MORE.
00062 02 FILLER PIC X(49) VALUE SPACE.
00063 02 FILLER PIC X(11) VALUE FLOATION ***.
00064 02 FILLER PIC X VALUE SPACE.
00065 02 MOP2-LCC PIC X(23) VALUE SPACE.
00066 02 FILLER PIC X(51) VALUE SPACE.
00067 01 MORE.
00068 02 FILLER PIC X(2) VALUE SPACE.
00069 02 FILLER PIC X(4) VALUE FLOATION ***.
00070 02 FILLER PIC X(10) VALUE FLOATION ***.
00071 02 FILLER PIC X(1) VALUE FLOATION ***.
00072 02 MOP3-NAME PIC X(4) VALUE SPACE.
00073 02 FILLER PIC X(1) VALUE SPACE.
00074 01 MORE.
00075 02 FILLER PIC X(19) VALUE SPACE.
00076 02 FILLER PIC XX VALUE ***.
00077 02 FILLER PIC X(15) VALUE SPACE.
00078 02 FILLER PIC X(1) VALUE SPACE.
00079 02 FILLER PIC X(10) VALUE FLOATION ***.
00080 02 FILLER PIC X(10) VALUE FLOATION ***.
00081 02 FILLER PIC X(10) VALUE FLOATION ***.
00082 02 FILLER PIC X(10) VALUE FLOATION ***.
00083 02 FILLER PIC X(10) VALUE FLOATION ***.
00084 02 FILLER PIC X(10) VALUE FLOATION ***.
00085 02 FILLER PIC X(10) VALUE FLOATION ***.
00086 02 FILLER PIC X(10) VALUE FLOATION ***.
00087 02 FILLER PIC X(10) VALUE FLOATION ***.
00088 02 FILLER PIC X(10) VALUE FLOATION ***.
00089 02 FILLER PIC X(10) VALUE FLOATION ***.
00090 02 FILLER PIC X(10) VALUE FLOATION ***.
00091 02 FILLER PIC X(10) VALUE FLOATION ***.
00092 02 FILLER PIC X(10) VALUE FLOATION ***.
00093 02 FILLER PIC X(10) VALUE FLOATION ***.
00094 02 FILLER PIC X(10) VALUE FLOATION ***.
00095 02 FILLER PIC X(10) VALUE FLOATION ***.
00096 02 FILLER PIC X(10) VALUE FLOATION ***.
00097 02 FILLER PIC X(10) VALUE FLOATION ***.
00098 02 FILLER PIC X(10) VALUE FLOATION ***.
00099 02 FILLER PIC X(10) VALUE FLOATION ***.
00100 01 MORE.
00101 02 FILLER PIC X(10) VALUE SPACE.
00102 02 FILLER PIC XX VALUE ***.
00103 02 FILLER PIC X(10) VALUE FLOATION ***.
00104 02 FILLER PIC X(10) VALUE FLOATION ***.
00105 02 FILLER PIC X(10) VALUE FLOATION ***.
00106 02 FILLER PIC X(10) VALUE FLOATION ***.
00107 02 FILLER PIC X(10) VALUE FLOATION ***.
00108 02 FILLER PIC X(10) VALUE FLOATION ***.
00109 02 FILLER PIC X(10) VALUE FLOATION ***.
00110 02 FILLER PIC X(10) VALUE FLOATION ***.
00111 02 FILLER PIC X(10) VALUE FLOATION ***.
00112 02 FILLER PIC X(10) VALUE FLOATION ***.
00113 02 FILLER PIC X(10) VALUE FLOATION ***.
00114 01 MORE.

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00115 02 FILLER PIC X(17) VALUE SPACE.
00116 02 FILLER PIC X(17) VALUE PUBLIC#.
00117 02 FILLER PIC X(17) VALUE SPACE.
00118 02 FILLER PIC X(17) VALUE # FIRE FIF.
00119 02 FILLER PIC X(17) VALUE # STAGE CR.
00120 02 FILLER PIC X(17) VALUE # RIT #.
00121 02 FILLER PIC X(17) VALUE # TOTAL #.
00122 01 D42-P1.
00123 02 FILLER PIC X(17) VALUE # TIME POPUL#.
00124 02 FILLER PIC X(17) VALUE # LATION SUP#.
00125 02 FILLER PIC X(17) VALUE # POP CONJ#.
00126 02 FILLER PIC X(17) VALUE # LOGIST #.
00127 02 FILLER PIC X(17) VALUE # PERSON IN#.
00128 02 FILLER PIC X(17) VALUE # POP#.
00129 02 FILLER PIC X(17) VALUE SPACE.
00130 02 FILLER PIC X(17) VALUE # PETROL MAT#.
00131 02 FILLER PIC X(17) VALUE # CH AREAS I#.
00132 02 FILLER PIC X(17) VALUE # INSTL #.
00133 02 FILLER PIC X(17) VALUE # HR PER #.
00134 02 FILLER PIC X(17) VALUE SPACE.
00135 01 H0P51.
00136 02 FILLER PIC X(17) VALUE SPACE.
00137 02 FILLER PIC X(17) VALUE #.
00138 02 FILLER PIC X(17) VALUE SPACE.
00139 02 FILLER PIC X(17) VALUE # LESS I#.
00140 02 FILLER PIC X(17) VALUE # HRN 24 HOUR#.
00141 02 FILLER PIC X(17) VALUE # COVERAGE#.
00142 02 FILLER PIC X(17) VALUE # LESS I#.
00143 02 FILLER PIC X(17) VALUE # HRN 24 HOUR#.
00144 02 FILLER PIC X(17) VALUE # COVERAGE#.
00145 02 FILLER PIC X(17) VALUE SPACE.
00146 02 FILLER PIC X(17) VALUE #.
00147 02 FILLER PIC X(17) VALUE SPACE.
00148 01 D41-P2.
00149 02 FILLER PIC X(17) VALUE SPACE.
00150 02 FILLER PIC X(17) VALUE # TOT <24 #.
00151 02 FILLER PIC X(17) VALUE SPACE.
00152 01 D42-P2.
00153 02 FILLER PIC X(17) VALUE # TIME POPUL#.
00154 02 FILLER PIC X(17) VALUE # LATION TR#.
00155 02 FILLER PIC X(17) VALUE # AIN PREVE#.
00156 02 FILLER PIC X(17) VALUE # NT ADMIN #.
00157 02 FILLER PIC X(17) VALUE SPACE.
00158 02 FILLER PIC X(17) VALUE # HR PER#.
00159 02 FILLER PIC X(17) VALUE SPACE.
00160 01 D41-P4.
00161 02 FILLER PIC X(17) VALUE # TIME POPUL#.
00162 02 FILLER PIC X(17) VALUE # LATION ST#.
00163 02 FILLER PIC X(17) VALUE # RUCT TRANS#.
00164 02 FILLER PIC X(17) VALUE # GRASS #.
00165 02 FILLER PIC X(17) VALUE # RUBB OT#.
00166 02 FILLER PIC X(17) VALUE # HRN TOT #.
00167 02 FILLER PIC X(17) VALUE # AVAIL#.
00168 02 FILLER PIC X(17) VALUE # EST R#.
00169 02 FILLER PIC X(17) VALUE # REQ MIN #.
00170 02 FILLER PIC X(17) VALUE # SUR-SHT S#.
00171 02 FILLER PIC X(17) VALUE # SUR-SHT TOT#.

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GOLETA 64/45/6600

COBOL 1.1 - EDITION OF 10/02/73

PROGRAM 1 FIRE

01/03/81

PLC: 00004

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00172 02 FILLER PIC X(10) VALUE #1AL TOTL
00173 02 FILLER PIC X(10) VALUE #AL
00174 01 042-04.
00175 02 FILLER PIC X(32) VALUE SPACE.
00176 02 FILLER PIC X(8) VALUE #ABRUSH #.
00177 02 FILLER PIC X(10) VALUE SPACE.
00178 02 FILLER PIC X(10) VALUE # FIPS #.
00179 02 FILLER PIC X(10) VALUE # 24 HR.
00180 02 FILLER PIC X(10) VALUE # 24 HR.
00181 02 FILLER PIC X(10) VALUE # 24 HR.
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00225 02 FILLER PIC X(10) VALUE # 24 HR.
00226 02 FILLER PIC X(10) VALUE # 24 HR.
00227 02 FILLER PIC X(10) VALUE # 24 HR.
00228 02 FILLER PIC X(10) VALUE # 24 HR.
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00229 01 TEMP          PIC 9(5)  VALUE ZERO.
00230 01 TEMPI          PIC 9(5)  VALUE ZERO.
00231 01 I              PIC 99    VALUE ZERO.
00232 01 PAGE3-LINE.
00233 03 FILLER          PIC XXX  VALUE # T=X.
00234 03 P3-TIME        PIC XXX  VALUE SPACE.
00235 03 FILLER          PIC X    VALUE SPACE.
00236 03 P3-POP         PIC 7,77,777.
00237 03 FILLER          PIC XX   VALUE SPACE.
00238 03 P3-K           PIC 779,99.
00239 03 FILLER          PIC X    VALUE SPACE.
00240 03 P3-L           PIC 779,99.
00241 03 FILLER          PIC X    VALUE SPACE.
00242 03 P3-M           PIC 779,99.
00243 03 FILLER          PIC X(55) VALUE SPACE.
00244 01 PAGE4-LINE.
00245 03 FILLER          PIC XXX  VALUE # T=X.
00246 03 P4-TIME        PIC XXX  VALUE SPACE.
00247 03 FILLER          PIC X    VALUE SPACE.
00248 03 P4-POP         PIC 7,77,777.
00249 03 FILLER          PIC X    VALUE SPACE.
00250 03 P3-STRUCT      PIC 779,99.
00251 03 FILLER          PIC X    VALUE SPACE.
00252 03 P3-TRANS      PIC 779,99.
00253 03 FILLER          PIC X    VALUE SPACE.
00254 03 P3-GRASS       PIC 779,99.
00255 03 FILLER          PIC X    VALUE SPACE.
00256 03 P3-CURD        PIC 779,99.
00257 03 FILLER          PIC X    VALUE SPACE.
00258 03 P3-OTHEP      PIC 779,99.
00259 03 FILLER          PIC X    VALUE SPACE.
00260 03 P3-TOT-INCI     PIC 779,99.
00261 03 FILLER          PIC X(7)  VALUE SPACE.
00262 03 P4-AVAIL-24HR   PIC 779,99.
00263 03 FILLER          PIC X    VALUE SPACE.
00264 03 P4-EST-REQ-24HR PIC 779,99.
00265 03 FILLER          PIC X    VALUE SPACE.
00266 03 P4-MIN-24HR    PIC 779,99.
00267 03 FILLER          PIC X    VALUE SPACE.
00268 03 P4-CUB-SMT-POPEST PIC ---9,99.
00269 03 P4-SUP-SMT-DEPPOL PIC ---9,99.
00270 03 P4-TOT-POPEST  PIC ---9,99.
00271 03 P4-TOT-DEPPOL  PIC ---9,99.
00272 01 WORK-COUNTERS.
00273 03 AVAIL-24HR      PIC 9(6)  VALUE ZERO.
00274 03 NO-FIVE-24HR    PIC 9(6)  VALUE ZERO.
00275 03 W              PIC 9(6)  VALUE ZERO.
00276 03 LAMBDA         PIC 9(6)  VALUE ZERO.
00277 03 LAMBDA1        PIC 9(6)  VALUE ZERO.
00278 03 LAMBDA2        PIC 9(6)  VALUE ZERO.
00279 03 S              PIC 9(6)  VALUE ZERO.
00280 03 LAMB1POP         PIC 9(6)  VALUE ZERO.
00281 03 LAMB2POP        PIC 9(6)  VALUE ZERO.
00282 03 TEMPF3         PIC 9(6)  VALUE ZERO.
00283 03 FACTORS        PIC 9(6)  VALUE ZERO.
00284 03 EST-REQ-24HR-CEP PIC 9(6)  VALUE ZERO.
00285 03 SUPPLUS        PIC 9(6)  VALUE ZERO.

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00286 03 SMC TAGC PIC 9(16) VALUE ZERO.
00287 03 FIPS-PER-DAY PIC 9(16) VALUE ZERO.
00288 03 RATIO PIC 9(9) VALUE ZERO.
00289 03 DELTAPOD PIC 9(17) VALUE ZERO.
00290 01 TYPE1.
00291 03 LOCATESN PIC 1(20) VALUE SPACE.
00292 03 FILLER PIC 1(4) VALUE SPACE.
00293 03 TYPES PIC 1(4) VALUE SPACE.
00294 03 FILLER PIC 1(51) VALUE SPACE.
00295 03 CODE1 PIC 9 VALUE ZERO.
00296 01 TYPE4.
00297 03 T2-TIME PIC 11 VALUE SPACE.
00298 03 T2-POP PIC 9(17) VALUE ZERO.
00299 03 ROUT-FUNC-24HR-COV.
00300 05 T2-SUPP PIC 9(4) VALUE ZERO.
00301 05 T2-COMM PIC 9(4) VALUE ZERO.
00302 05 T2-LOC PIC 9(4) VALUE ZERO.
00303 05 T2-REFSON PIC 9(4) VALUE ZERO.
00304 05 T2-PUBLIC-INEC PIC 9(4) VALUE ZERO.
00305 01 CRISIS-REL-FUNC-24HR. PIC 999 VALUE ZERO.
00306 05 T2-FIRE-PATROL PIC 999 VALUE ZERO.
00307 05 T2-FIRE-MATCHES PIC 999 VALUE ZERO.
00308 05 T2-STAGING PIC 999 VALUE ZERO.
00309 05 T2-CRIT-INST-SUPP PIC 999 VALUE ZERO.
00310 05 T2-D PIC 999 VALUE ZERO.
00311 01 ROUT-FUNC-LESS-24HR. PIC 999 VALUE ZERO.
00312 05 T2-TRAINING PIC 999 VALUE ZERO.
00313 05 T2-PREVENTION PIC 999 VALUE ZERO.
00314 05 T2-ADMIN PIC 999 VALUE ZERO.
00315 05 T2-F PIC 999 VALUE ZERO.
00316 05 T2-G PIC 999 VALUE ZERO.
00317 01 CRISIS-FEL-FUNC-LESS-24HR.
00318 05 T2-H PIC 999 VALUE ZERO.
00319 05 T2-I PIC 999 VALUE ZERO.
00320 05 T2-J PIC 999 VALUE ZERO.
00321 03 T2-WORK-SHIFT PIC 9 VALUE ZERO.
00322 03 T2-SHIFT-CODE PIC 9 VALUE ZERO.
00323 03 T2-MIN-24HR-PER PIC 999 VALUE ZERO.
00324 03 T2-MARKLOAD-RED PIC 9(9) VALUE ZERO.
00325 03 CODE2 PIC 9 VALUE ZERO.
00326 01 TYPE3.
00327 03 INCIDENT-TYPES.
00328 05 T3-STRUCT PIC 9(5) VALUE ZERO.
00329 05 T3-TRANSP PIC 9(5) VALUE ZERO.
00330 05 T3-GRASS PIC 9(5) VALUE ZERO.
00331 05 T3-ROBB PIC 9(5) VALUE ZERO.
00332 05 T3-OTHER PIC 9(5) VALUE ZERO.
00333 05 T3-X PIC 9(5) VALUE ZERO.
00334 05 T3-L PIC 9(5) VALUE ZERO.
00335 05 T3-M PIC 9(5) VALUE ZERO.
00336 05 T3-AVG PIC 9(9) VALUE ZERO.
00337 05 FILLER PIC 1(32) VALUE SPACE.
00338 03 FILLER PIC 1(4) VALUE SPACE.
00339 03 T3-CODE PIC 9 VALUE ZERO.
00340 01 TYPE2.
00341 03 INCIDENT-TYPES-CONT.
00342 05 T4-TOTAL PIC 9(6) VALUE ZERO.

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00343 03 FILLER PIC X(14) VALUE SPACE.
00344 03 K1 PIC 9(9) VALUE ZERO.
00345 03 K2 PIC 9(9) VALUE ZERO.
00346 03 T4-2440-COV PIC 9(5) VALUE ZERO.
00347 03 NQPM-POP PIC 9(7) VALUE ZERO.
00348 03 T4-CUR-ASSIGN PIC 9(4) VALUE ZERO.
00349 01 H2RI.
00350 02 DUMMY.
00351 03 FILLER PIC X(18) VALUE SPACE.
00352 03 FILLER PIC XX VALUE ***.
00353 03 FILLER PIC X(4) VALUE SPACE.
00354 03 FILLER PIC XXX VALUE X1N.
00355 03 FILLER PIC X(10) VALUE # C I C E N.
00356 03 FILLER PIC X(10) VALUE # T S P.
00357 03 FILLER PIC X(10) VALUE # R C.
00358 03 FILLER PIC X(13) VALUE # Y.
00359 03 ASTP PIC XY VALUE SPACE.
00360 02 BLANK-IT.
00361 03 FILLER PIC X(15) VALUE SPACE.
00362 03 FILLER PIC X(10) VALUE # N C I D.
00363 03 FILLER PIC X(10) VALUE # N T S.
00364 03 FILLER PIC X(10) VALUE # P E O.
00365 03 FILLER PIC X(10) VALUE # D A V.
00366 01 TOT-INC PIC 9(6)V999 VALUE ZERO.
00367 01 TOT-STRUCT PIC 9(6)V999 VALUE ZERO.
00368 01 TOT-TFENSE PIC 9(6)V999 VALUE ZERO.
00369 01 TOT-CPASS PIC 9(6)V999 VALUE ZERO.
00370 01 C PIC 9(6)V999 VALUE ZERO.
00371 01 EST PIC 9(6)V999 VALUE ZERO.
00372 01 SUP PIC 9(6)V999 VALUE ZERO.
00373 01 SHT PIC 9(6)V999 VALUE ZERO.
00374 01 TOT-POEST PIC 9(6)V999 VALUE ZERO.
00375 01 TOT-POL PIC 9(6)V999 VALUE ZERO.
00376 01 TOT-OTHER PIC 9(6)V999 VALUE ZERO.
00377 01 TOT-K PIC 9(6)V999 VALUE ZERO.
00378 01 TOT-L PIC 9(6)V999 VALUE ZERO.
00379 01 TOT-INTOX PIC 9(6)V999 VALUE ZERO.
00380 01 TOT-M PIC 9(6)V999 VALUE ZERO.
00381 01 TOT-RUBR PIC 9(6)V999 VALUE ZERO.
00382 01 PER-SMET PIC 9(6)V999 VALUE ZERO.
00383 01 LAMBDA PIC 9(6)V999 VALUE ZERO.
00384 01 MUM-INFLU PIC 9(6)V999 VALUE ZERO.
00385 01 INT-FIRES PIC 9(6)V999 VALUE ZERO.
00386 01 INT-FIRES PIC 9(6)V999 VALUE ZERO.

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00387 PROCEDURE DIVISION.
00388 START.
00389 OPEN INPUT DATA-IN.
00390 OPEN OUTPUT OUTPUT-1, OUTPUT-2, OUTPUT-4.
00391 READ-DATA.
00392 READ DATA-IN AT END GO TO EOJ.
00393 IF DATA-CODE = 1 MOVE IN-REC TO TYPE1 SO TO HEADER-CARD.
00394 IF DATA-CODE = 2 MOVE IN-REC TO TYPE2 GO TO READ-DATA.
00395 IF DATA-CODE = 3 MOVE IN-REC TO TYPE3 GO TO
00396 READ-DATA.
00397 IF DATA-CODE = 4 MOVE IN-REC TO TYPE4
00398 GO TO DETAIL-INFO-NATION.
00399 DISPLAY INVALID CARD CODE LOOK AT DATA * GO TO EOJ.
00400 HEADER-CARD.
00401 PERFORM HEADERS.
00402 MOVE ZERO TO I.
00403 GO TO READ-DATA.
00404 DETAIL-INFO-NATION.
00405 COMPUTE I = I + 1.
00406 MOVE T2-TIME TO P1-TIME, P3-TIME, P4-TIME.
00407 MOVE T2-POP TO P1-POP, P3-POP, P4-POP.
00408 MOVE T2-SUPP TO P1-SUPP.
00409 MOVE T2-LOG TO P1-LOG.
00410 MOVE T2-COMM TO P1-COMM.
00411 MOVE T2-STAGING TO P1-STAGING.
00412 MOVE T2-PUBLIC-INFO TO P1-PUBLIC-INFO.
00413 MOVE T2-ARSON TO P1-ARSON.
00414 MOVE T2-FIRE-PATROL TO P1-FIRE-PATROL.
00415 MOVE T2-FIRE-WATCHES TO P1-FIRE-WATCHES.
00416 MOVE T2-CRIT-INST-SUPP TO P1-CRIT-INST-SUPP.
00417 COMPUTE TEMP = T2-SUPP + T2-LOG + T2-COMM +
00418 T2-PUBLIC-INFO.
00419 COMPUTE TEMP = TEMP + T2-ARSON + T2-FIRE-PATROL +
00420 T2-FIRE-WATCHES.
00421 COMPUTE TEMP = TEMP + T2-CRIT-INST-SUPP.
00422 COMPUTE TEMP = TEMP + T2-STAGING.
00423 MOVE TEMP TO P1-TOT.
00424 WRITE OUT-REC1 FROM PAGE1-LINE AFTER ADVANCING 2 LINES.
00425 MOVE T2-TRAINING TO P1-SUPP.
00426 MOVE T2-PREVENTION TO P1-COMM.
00427 MOVE T2-ADMIN TO P1-LOG.
00428 MOVE T2-F TO P1-ARSON.
00429 MOVE T2-G TO P1-PUBLIC-INFO.
00430 MOVE ZEROS TO P1-CRIT-INST-SUPP, P1-STAGING.
00431 MOVE ZEROS TO P1-FIRE-PATROL.
00432 COMPUTE TEMP1 = T2-FIRE-WATCHES.
00433 T2-F + T2-G.
00434 MOVE TEMP1 TO P1-TOT.
00435 WRITE OUT-REC2 FROM PAGE1-LINE AFTER ADVANCING 2 LINES.
00436
00437 PAGE-3. IF I NOT = 1 PERFORM OTHER-TIME THRU OTHER-TIME-END
00438 GO TO A.
00439 IF T4-TOTAL = 0
00440 COMPUTE TOT-INC = (NORM-POP * .016) / 365.
00441 IF T4-TOTAL > 0
00442 COMPUTE TOT-INC = T4-TOTAL / 365.
00443

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0019 0021 0240
0023 0021 0340
0023 0021 0326
0023 0021
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0231 0231
0237 0207 0234
0240 0207 0235
0240 0390
0209 0302
0213 0301
0211 0304
0214 0304
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0217 0306
0229 0307
0222 0306
0225 0229 0300 0302
0391 0229 0229 0303
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0397 0229 0229
0399 0229 0229
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0225 0029 0203
0312
0209 0313
0211 0316
0213 0316
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0220 0230 0312 0313
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0224 0333 0213
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0356 0347
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0355 0342

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GOLETA 64/65/6600 CC90L 1.1 - EDITION OF 18/02/73 PROGRAM 1 FIRE 01/01/99 PLO: 00017

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00501 IF I NOT = 1 AND T3-M > 0
00502 COMPUTE RATIO = T3-M / T4-TOTAL
00503 COMPUTE TOT-M = TOT-INC * RATIO.
00504 MOVE TOT-M TO P1-M.
00505 MOVE T2-TIME TO P2-TIME.
00506 MOVE T2-POP TO P4-POP.
00507
00508 A-END.
00509
00510 GO TO NEXT-CAL.
00511
00512 OTHER-TIME.
00513 COMPUTE HUM-INFLU = .8.
00514 IF T3-HUM-AVG > 0 MOVE T3-HUM-AVG TO HUM-INFLU.
00515 IF K2 = 0 COMPUTE K2 = 1.
00516 IF K1 = 0 COMPUTE K1 = 1.
00517 IF T4-TOTAL = 0
00518 COMPUTE T4-TOTAL ROUNDED = NORM-POP * .016.
00519 COMPUTE LAMBDA1 = T4-TOTAL / NORM-POP.
00520 DISPLAY LAMBDA1 * LAMBDA2 * (1 - HUM-INFLU).
00521 COMPUTE LAMBDA2 = LAMBDA1 * LAMBDA1.
00522 DISPLAY LAMBDA2 * LAMBDA2.
00523 COMPUTE INT-FIPES = (LAMBDA1 * NORM-POP) + (LAMBDA2 * T2-POP).
00524 OTHER-TIME-END.
00525 COMPUTE TOT-INC ROUNDED = (INT-FIPES * K2) / 365.
00526 NEXT-CAL.
00527 IF T2-WORK-SHFT = 0 MOVE 3 TO T2-WORK-SHFT.
00528 COMPUTE PER-SHFT ROUNDED = TEMP / T2-WORK-SHFT.
00529 DISPLAY PER-SHFT * PER-SHFT.
00530 MOVE PER-SHFT TO P4-AVAIL-2-MR.
00531 IF T4-TOTAL = 0
00532 COMPUTE TOT-INC = (NORM-POP * .016) / 365.
00533 DISPLAY TOT-INC * TOT-INC.
00534 IF T4-TOTAL > 0 COMPUTE TOT-INC = T4-TOTAL / 365.
00535 COMPUTE M = T4-24HR-COV / TOT-INC.
00536 DISPLAY M * M.
00537 IF T2-WORKLOAD-RED = 0 MOVE 1 TO T2-WORKLOAD-RED.
00538 MOVE T2-WORKLOAD-RED TO M.
00539 DISPLAY M * M.
00540 IF T2-WORK-SHFT = 3 AND T2-SHFT-CODE = 3 MOVE 365 TO S.
00541 IF T2-WORK-SHFT = 2 AND T2-SHFT-CODE = 2 MOVE 365 TO S.
00542 IF T2-WORK-SHFT = 1 AND T2-SHFT-CODE = 1 MOVE 710 TO S.
00543 IF T2-WORK-SHFT = 3 AND T2-SHFT-CODE = 1 MOVE 109 TO S.
00544 DISPLAY S * S.
00545 COMPUTE FACTORS = TEMP - T4-CUR-ASSIGN.
00546 DISPLAY FACTORS * FACTORS.
00547 COMPUTE C ROUNDED = FACTORS / T2-WORK-SHFT.
00548 DISPLAY C * C.
00549
00550 AB.
00551 PERFORM OTHER-TIME.
00552 COMPUTE EST = INT-FIRES / S.
00553 DISPLAY EST * EST.
00554 COMPUTE EST = (EST * M * K1 * K2 * M).
00555 COMPUTE EST = EST * C.
00556 MOVE EST TO P4-EST-REQ-24HR.
00557
00558 NINE.
00559 MOVE T2-MIN-24HR-PER TO P4-MIN-24HR.
00560
00561 TEN.
00562 COMPUTE SUR = PER-SHFT - EST.
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COLETA	64/65/6688	COBOL 1.1	- EDITION OF 10/02/73	PROGRAM 1	PAGE	01/01/74	PAGE 0001A
00550				MOVE SUR TO PL-SUR-SMT-POEST.			0371 0372
00551				ELEVEN.			0373 0373
00552				COMPUTE SMT = PEP-SMT - T2-WIN-24-MP-FEP.			0374 0374
00553				MOVE SMT TO PL-SUR-SMT-DEPOL.			0375 0375
00554				TWELVE.			0376 0376
00555				COMPUTE TOT-POEST = TEST + T2-WORK-SMT + TEMPI.			0377 0377
00556				MOVE TOT-POEST TO PL-TOT-POEST.			0378 0378
00557				THIRTEEN.			0379 0379
00558				COMPUTE TOT-POL = IT2-WIN-24-MP-FEP + T2-WORK-SMT + TEMPI.			0380 0380
00559				MOVE TOT-POL TO PL-TOT-DEPOL.			0381 0381
00560				WRITE OUT-REC FROM PAGE4-LINE AFTER ADVANCING 2 LINES.			0382 0382
00561				GO TO READ-DATA.			0383 0383
00562				HEADERS.			0384 0384
00563				MOVE 1 TO PAGE-CNT.			0385 0385
00564				MOVE 08 TO HDR1-M4.			0386 0386
00565				MOVE 14 TO HDR1-DY.			0387 0387
00566				MOVE 79 TO HDR1-YR.			0388 0388
00567				WRITE OUT-REC1 FROM HDR1.			0389 0389
00568				MOVE 2 TO PAGE-CNT.			0390 0390
00569				WRITE OUT-REC2 FROM HDR1.			0391 0391
00570				MOVE 3 TO PAGE-CNT.			0392 0392
00571				WRITE OUT-REC3 FROM HDR1.			0393 0393
00572				MOVE LOCATESK TO HDR2-LCC.			0394 0394
00573				WRITE OUT-REC1 FROM HDR2 AFTER ADVANCING 2 LINES.			0395 0395
00574				WRITE OUT-REC2 FROM HDR2 AFTER ADVANCING 2 LINES.			0396 0396
00575				WRITE OUT-REC3 FROM HDR2 AFTER ADVANCING 2 LINES.			0397 0397
00576				MOVE TYPES TO HDR3-NAME.			0398 0398
00577				WRITE OUT-REC1 FROM HDR3 AFTER ADVANCING 2 LINES.			0399 0399
00578				WRITE OUT-REC2 FROM HDR3 AFTER ADVANCING 2 LINES.			0400 0400
00579				WRITE OUT-REC3 FROM HDR3 AFTER ADVANCING 2 LINES.			0401 0401
00580				MOVE LOCATESK TO HDR4-LCC.			0402 0402
00581				WRITE OUT-REC1 FROM HDR4 AFTER ADVANCING 2 LINES.			0403 0403
00582				WRITE OUT-REC2 FROM HDR4 AFTER ADVANCING 2 LINES.			0404 0404
00583				WRITE OUT-REC3 FROM HDR4 AFTER ADVANCING 2 LINES.			0405 0405
00584				MOVE TYPES TO HDR5-NAME.			0406 0406
00585				WRITE OUT-REC1 FROM HDR5 AFTER ADVANCING 2 LINES.			0407 0407
00586				WRITE OUT-REC2 FROM HDR5 AFTER ADVANCING 2 LINES.			0408 0408
00587				WRITE OUT-REC3 FROM HDR5 AFTER ADVANCING 2 LINES.			0409 0409
00588				MOVE LOCATESK TO HDR6-LCC.			0410 0410
00589				WRITE OUT-REC1 FROM HDR6 AFTER ADVANCING 2 LINES.			0411 0411
00590				WRITE OUT-REC2 FROM HDR6 AFTER ADVANCING 2 LINES.			0412 0412
00591				WRITE OUT-REC3 FROM HDR6 AFTER ADVANCING 2 LINES.			0413 0413
00592				MOVE SPACES TO BLANK-IT.			0414 0414
00593				MOVE *** TO ASTR.			0415 0415
00594				WRITE OUT-REC1 FROM HDR1 AFTER ADVANCING 2 LINES.			0416 0416
00595				MOVE SPACES TO OUT-REC4.			0417 0417
00596				WRITE OUT-REC4 AFTER ADVANCING 2 LINES.			0418 0418
00597				WRITE OUT-REC1 FROM HDR6 AFTER ADVANCING 2 LINES.			0419 0419
00598				WRITE OUT-REC2 FROM HDR6 AFTER ADVANCING 2 LINES.			0420 0420
00599				WRITE OUT-REC3 FROM HDR6 AFTER ADVANCING 2 LINES.			0421 0421
00600				WRITE OUT-REC4 FROM HDR6 AFTER ADVANCING 2 LINES.			0422 0422
00601				MOVE LOCATESK TO HDR7-LCC.			0423 0423
00602				WRITE OUT-REC1 FROM HDR7 AFTER ADVANCING 2 LINES.			0424 0424
00603				WRITE OUT-REC2 FROM HDR7 AFTER ADVANCING 2 LINES.			0425 0425
00604				WRITE OUT-REC3 FROM HDR7 AFTER ADVANCING 2 LINES.			0426 0426
00605				WRITE OUT-REC4 FROM HDR7 AFTER ADVANCING 2 LINES.			0427 0427
00606				MOVE LOCATESK TO HDR8-LCC.			0428 0428
00607				WRITE OUT-REC1 FROM HDR8 AFTER ADVANCING 2 LINES.			0429 0429
00608				WRITE OUT-REC2 FROM HDR8 AFTER ADVANCING 2 LINES.			0430 0430
00609				WRITE OUT-REC3 FROM HDR8 AFTER ADVANCING 2 LINES.			0431 0431
00610				WRITE OUT-REC4 FROM HDR8 AFTER ADVANCING 2 LINES.			0432 0432
00611				HEADERS-END.			0433 0433
				EOJ.			0434 0434
				DISPLAY # ALL DONE #.			0435 0435
				STOP RUN.			0436 0436

LOCATION ** OKLA MCNA CITY, OK

PROTECTED AREA TYPE: RISK

K1=1.0
K2=1.0
W=1.0

** PERSONNEL PERSONNEL PERSONNEL **
** 24 HOUR COVERAGE 24 HOUR COVERAGE **

** ROUTINE FUNCTIONS ** ** CRISIS RELOCATION FUNCTIONS **

TIME	POPULATION	SUPPR	COMPU	LOGIST	ARSON	PUBLIC INFO	FIRE PATROL	FIRE STAGE MATCH AREAS	CRIT INSTL	TOTAL 24 HR PER
T=6	386,800	675	16		8			5	8	712
T=80	339,680	642	16		8			29	8	733
T= 6	280,680	649	16					30	8	703
T=15	158,840	652	8					34	8	712
T=24	129,840	649	8					34	8	699
T=48	29,880	645	8					34	18	697

LOCATION ** OKLA WOMA CITY, OK

PROTECTED AREA TYPE: 1 RISK

** PERSONNEL PERSONNEL PERSONNEL **

** LESS THAN 24 HOUR COVERAGE LESS THAN 24 HOUR COVERAGE **

** FIGHTING FUNCTIONS ** ** CRISIS DELOCATION FUNCTIONS **

TOT 49.
ML P22

TIME POPULATION TRAIN PREVENT 40-74

T=6	386,000	12	5	20	6	76
T=00	335,850	15	6	21	7	83
T=6	280,600	22	5	21	8	96
T=15	150,840	24	5	21	7	97
T=24	129,840	28	5	21	6	100
T=40	29,000	30	5	21	6	102

LOCATION ** OKLA WOMA CITY, OK

PROTECTED AREA TYPE: RISK

** INCIDENTS PER DAY **

TIME	POPULATION	STRUCT TRAPS	GRASS #BRUSH	RUPB	OTHER TOT FIRES	AVAIL 24 HR PER/SHF	EST REQ 24 HR PER/SHF BASE POP	4IN 24 HR PER/SHF POP	SUR-SMT 24 HR PER/SHF POP	SUR-SMT 24 HR PER/SHF POP	TOTAL PER/DAY BASE EST DEP	TOTAL PER/DAY BASE EST DEP		
T=6	386,000	3.43	3.41	5.64	3.71	23.87	39.89	356.00	122.44	0.00	213.55	356.00	332.84	56.00
T=00	339,600	3.46	3.08	4.56	3.35	21.56	36.03	351.50	106.70	0.00	244.79	351.50	268.40	55.00
T=6	289,600	3.05	2.72	4.02	2.96	19.04	31.81	351.50	94.32	0.00	257.17	351.50	244.64	56.00
T=15	159,940	2.02	1.90	2.66	1.96	12.61	21.37	351.00	62.30	0.00	298.69	351.00	181.61	57.00
T=24	129,840	1.79	1.60	2.36	1.73	11.17	18.67	349.50	55.77	0.00	293.72	349.50	171.55	64.00
T=49	29,000	0.99	0.88	1.30	0.96	6.10	10.33	348.50	32.30	0.00	316.20	348.50	126.60	62.00

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UNCLASSIFIED, Ryland Research, Inc. Santa Barbara, CA 93111
September 1980, pages. (Contract No. DCPA01-77-C-0212,
work unit 2531-F). ABSTRACT

A crisis relocation, as well as other types of civilian evacuation, imposes significant demands upon a community's public safety resources (law enforcement, fire protection and rescue medical services). In planning for public safety operations, personnel must estimate the types and magnitude of these demands; and, if possible, establish procedures for reducing these demands to manageable levels. This Guide:
a) identifies factors which can lead to increased resource requirements; b) suggests techniques for reducing these requirements; c) suggests techniques for increasing the availability of current resources; d) provides procedures (and a computer program) for estimating public safety resource requirements for an evacuation operation.

The Guide was prepared especially for use by local government public safety planning personnel.

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